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The authors of the Short Contributions are responsible for the correctness of their texts. Whenever possible an alphabetic order of the contributions was chosen. Please note that Splinter B had to be cancelled and does not appear in the contents list.

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Poster

Sun, Solar System, Stars, Interstellar Matter, Galaxy, Extragalactic Systems, Instruments, History of Astronomy

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Calibrations on DSS-II Plates

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The photographic sky surveys produced by large Schmidt telescopes have proved to be among the most useful and enduring weapons in the astronomical armory. With the start of the Digitized Sky Survey (hereafter DSS; Lasker & McLean 1994) new powerful tools have been established. To provide convenient access to these data, the images have been compressed using a technique based on the H-transform to reduce the data volume. Although the technique is lossy, it is adaptive so that it preserves the signal very well. While there are extensive studies on the photometric calibration of whole plates or even surveys on original uncompressed data (e.g. Reid & Gilmore 1982, Monet et al. 2003 = USNO-B), the possibilities of local small field calibration on compressed online available material were not detailed studied for stellar photometry. Galaxy surveys use this material more often and thus much better studies are available there (e.g. Hambly et al. 2001). Although there is often the need to look up the older epoch data, especially for eruptive variable stars, only limited effort on the source extraction and calibration technique for stars was done (e.g. Hörtnagl et al. 1992, Kimeswenger et al. 2003). The goal of this study here is to show how to optimize source extraction parameters in small fields around interesting sources. This allows a user to derive a high quality local calibration of online digitized plates, having only a few bright calibration sources in the field. Such calibrators can be obtained easily by CCD cameras at amateur size telescopes or training equipment of universities (Bacher et al. 2001). The method we present here is well suited to calibrate locally even H-compressed digital sky survey data by just using a few bright calibrators. The accuracy is about $0\overset{m}{.}1$ for a wide range. Thus also colour-colour diagrams are possible. This allows to do photometry of progenitors for eruptive events like novae as well as HR diagrams when searching for new candidates for stellar clusters. The importance for variable and eruptive star studies was pointed out recently by Munari et al. (2002), and Kimeswenger & Lechner (2003).

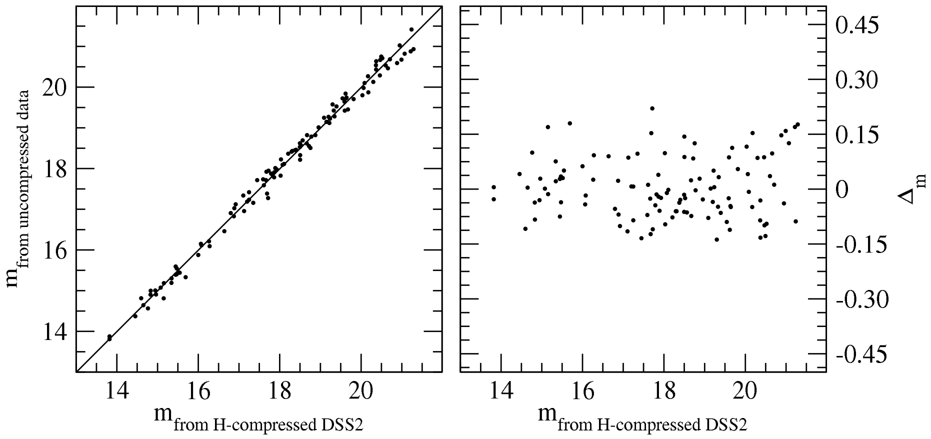

Fig. P 01. The photometry achieved on uncompressed vs. DSS-II H-compressed images around the suspected variable star V471 Per using the method described in section 3. There is obviously neither a systematic effect nor any degrading of the photometric quality.

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High-Resolution Near-Infrared Speckle Interferometry and Radiative Transfer Modeling of the OH/IR star OH 26.5+0.6

P 02

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We present near-infrared speckle interferometry of the OH/IR star OH 26.5+0.6 in the K' band obtained with the 6m telescope of the Special Astrophysical Observatory (SAO) in Oct. 2003. At a wavelength of λ = 2.12 μm the diffraction-limited resolution of 74 mas was attained. The reconstructed visibility function shows that the stellar contribution to the total flux at λ = 2.12 μm is less than 50%, indicating a rather large optical depth of the circumstellar dust shell (CDS) surrounding this highly reddened object, which is in accordance with the strong silicate absorption feature seen in the spectral energy distribution (SED). With respect to the asymmetry found from the recent VLTI/MIDI observations in the mid-infrared (Chesneau et al. 2004, A&A 435, 563), and from L-band observations (Starck et al. 1994, A&A 283, 349), we carefully checked our K-band data for signs of asymmetry, but given the accuracy of our measurements, no such asymmetry could be detected.

Our modeling approach follows a similar strategy as it was recently successfully applied to interpret observations of the OH/IR star OH 104.9+2.4 (Riechers et al. 2005, A&A 436, 925). For the radiative transfer modeling of the CDS of OH 26.5+0.6 with the code DUSTY, we used our K-band vibility data from 2003 as well as the ISO spectrum as observational input. Since OH 26.5+0.6 is a LPV, both observations are associated with different phases of the object's variability cycle. While the ISO observations were carried out close to minimum

phase (ϕ=0.5), our K-band visibility data correspond to ϕ=0.13. From our analysis, we derived several physical parameters of the central star and the CDS for these two phases and found a phase dependence similar to the results for OH 104.9+2.4. Since OH 26.5+0.6 was recently also observed with VLTI/MIDI, we finally discuss the implications of the MIDI results with respect to our model.

Mid-infrared long-baseline interferometry of the symbiotic Mira star RX Pup with the VLTI/MIDI instrument

P 03

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We present mid-infrared long-baseline interferometric observations of the symbiotic Mira star RX Pup obtained with the VLTI/MIDI instrument within the framework of the Science Demonstration Time program in February 2004. Four visibility measurements have been obtained using the unit telescopes UT2 and UT3, with projected baseline lengths ranging from 34.7 to 46.5 m. All visibility measurements show a distinct wavelength dependence: A rather steep decrease between 8 and 10 micron, and a shallower monotonic increase longward of 10 micron. For the corresponding uniform disk diameter, this visibility shape translates into a diameter increase by a factor of 2 from 25 to 50 mas between 8 and 10 micron and an almost wavelength independent diameter between 10 and 13 micron. As we show by means of radiative transfer modeling with the code DUSTY, this wavelength dependence detected with VLTI/MIDI can be well understood in terms of a circumstellar dust shell which is dominated by silicate dust.

N_2D^+ abundance in high mass star forming regions

P 04

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We report the first detections of N_2D^+ in high mass star forming regions. This is of particular interest, since N_2D^+ is one of the best tracers for H_2D^+, a key molecule in the chemical network.

The early stages of star formation occur in dense ($\approx 10^6\ \mathrm{cm}^{-3}$), cold ($\approx$ 10 K) and highly shielded ($A_v \approx 100$ mag) cloud cores. In such environments, the chemistry is very different form other locations in the universe, because many endothermic and most neutral-neutral reactions are suppressed and most molecules freeze out onto dust grains.

Therefore H_3^+ and its isotopic variants are the most abundant ions and have a major impact on the whole chemical network. Hence these ions have a wide influence on the chemistry in their environment. The H_2D^+/H_3^+ ratio in particular affects the relative abundance of deuterated species of most molecules (e.g. Millar et al. 2000). The fractionation of deuterated molecules occurs because of the endothermicity of reactions like

$$H_3^+ + HD \rightarrow H_2D^+ + H_2 \ \ (\Delta E = 220\,K)$$

For investigations of deuterium chemistry one would ideally observe the H_2D^+/H_3^+ ratio directly. However H_3^+ does not have a permanent dipol moment and the transitions of H_2D^+ are difficult to observe due to the low atmospheric transparency at its line frequencies. Because N_2 stays in gasphase quite long (compared to e.g. CO) its daughter molecule N_2D^+ is the next best tracer of cold gas and a probe for H_2D^+.

We observed several sources in high mass star forming regions in N_2D^+ J=3-2 (231 GHz) with the KOSMA 3m Telescope. Because of the large beam size (2'), the emission lines are very faint. Nevertheless, we have been able to detect N_2D^+ for the first time towards high mass star forming regions, namely S106 and the molecular ridge to the north of DR21 in Cygnus X.

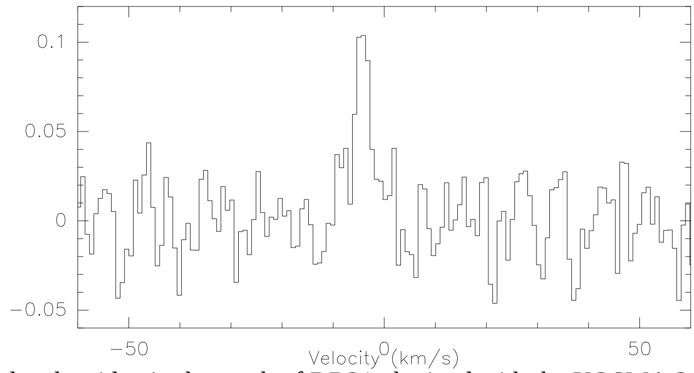

Fig. P 04. Spectrum of the molecular ridge in the north of DR21 obtained with the KOSMA 3 m Telescope. The Intensity is given in K (T_{mb}).

The detections towards high mass star forming regions are of particular interest, because accelerated collapse, as it is suggested by Lintott et al. (2005) can be ruled out in sources where N_2D^+ had enough time to form. Towards the source near DR21, we also observed N_2H^+ (3-2). Assuming an excitation temperature of 10 K, we derived an N_2D^+/N_2H^+ ratio of 0.13, leading to an H_2D^+/H_3^+ ratio of 0.297 following the calculation of Crapsi et al. (2004). Because of the large beam size and the uncertainty of T_{ex}, this ratio has to be treated with caution. Further observations with larger telescopes are intended to achieve an accurate N_2D^+/N_2H^+ ratio. Direct H_2D^+ measurements are planned with the CONDOR receiver (Bielau et al. this meeting).

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Causal Viscosity in Accretion Disc Boundary layers

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We study the structure of the boundary layer region between the disc and a comparatively slow rotating star using a causal prescription for viscosity. We allow the vertically integrated stress to relax towards its equilibrium value on a relaxation time-scale tau. This naturally yields a finite speed of propagation for viscous information. For a standard alpha in the range 0.1-0.01, and a ratio of viscous speed to sound speed in the range 0.02-0.5, details in the boundary layer are strongly affected by the the causality constraint. We study time-dependent models taking into account energy dissipation and transport. For alpha=0.01 and small viscous speeds the boundary layer adjusted to a near steady state. Sometimes a long-wavelength oscillation generated by viscous overstability could be seen near the outer boundary. Behaviour of this kind is potentially important in producing time-dependent behaviour in accreting systems such as cataclysmic variables and protostars.

Planetesimals in protoplanetary disks

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The formation and evolution of planetary systems and their relation to the origin of life is one of the most fundamental and fascinating problems of astrophysics. This topic is presently in a very exciting stage thanks to the breakthrough detection of about 120 extra-solar planets, orbiting other solar-type stars. This discovery also confirms the prediction of the Copernican Principle that the Solar System is not the only planetary system in the universe.

The central subject of the planet formation theory is to clarify the formation process of planetary systems. Large-scale simulations play important roles in the investigation of the complex physical processes of planet formation.We briefly introduce the results of our recent simulations in this field. We investigate the formation of protoplanet systems from planetesimal disks by global N-body simulations of planetary accretion (N = 30,000; 50,000; 100,000) and $0,5AU < a < 1,5AU$, where N is the number of bodies and *a* is the distance from a central star.

Gravity-assisted agglomeration of planetesimals in the protoplanetary disks around young stars is a backbone of a currently widely accepted paradigm of terrestrial planet formation, despite many uncertainties in the details of specific processes involved. In many respects our understanding of the planetesimal disk evolution heavily relies on the numerical investigations, and these studies significantly grew in complexity in recent years (Kenyon & Luu 1998, 2002; Inaba 2001). On one hand, the sheer scale of simulated systems has expanded considerably, which was made possible by the increase in computing power; on the other hand, a wider range of concomitant physical phenomena (fragmentation, migration, etc.) can now be routinely followed simultaneously with the evolution of planetesimal mass and velocity distributions.

Unfortunately, very often this complexity creates a problem when one tries to understand a *relative* role of each of the specific processes in shaping the planetesimal mass and velocity spectra. Disentangling the contributions of different physical nature in the results of numerical simulations certainly is a tantalizing task which can often yield very confusing conclusions. Thus it is very important to be able to isolate different physical processes operating in the planetesimal disks and to study their effects on the disk evolution separately. One way to do this is to build simple but realistic models which are easy to analyze and at the same time are able to grasp the main features of the physics involved. Such approach would grant us good analytical understanding of relevant processes, and we are going to follow this route in our study.

Star Clusters in the Large Magellanic Cloud

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The interaction of the Milky Way with the Small and the Large Magellanic Cloud (LMC) and the interaction between the Clouds affects the star formation history of these galaxies. Numerical simulations of the interaction history of the Clouds suggest that a close encounters between the components of this triple system took place as recently as 180 million years ago (Gardiner & Noguchi 1996), while another one should have occurred 1.4 Gyr ago. Interactions should trigger enhanced star formation, which should also be reflected in the age distribution of the star clusters in the Magellanic Clouds.

Bica et al. (1994) carried out integrated UBV photometry of 6659 star clusters in the LMC. We used their cluster catalog to re-identify these star clusters in the photometric catalog of the Magellanic Clouds Photometric Survey (MCPS) by Zaritsky et al. (2004). The MCPS is a CCD driftscan survey of the central 64 deg^2 of the LMC and contains resolved stellar point source photometry obtained in the UBVI bands. The MCPS data were used to determine the ages of star clusters in the LMC from their colour-magnitude diagrams and isochrone models of the Padua and the Geneva group. Owing to the limited depth of the MCPS we cannot age-date clusters older than approximately 1 billion years.

We compared our cluster ages to those of other studies such as the ages from integrated colors of Girardi et al. (1995) and the color-magnitude diagram study of Pietrzynski et al. (2000). Pietrzynski et al. used data from the Optical Gravitational Lensing Experiment (OGLE), which covers the high-density regions of the LMC. While Pietrzynski et al. measured ages for 745 clusters we derived ages for about twice that number.

We will present the resulting age distribution of the star clusters and investigate the recent spatial and temporal star formation history of the LMC covering a period of approximately 10 million years to 1 billion years (about four rotation periods). We find clear evidence for episodic star formation.

Is there a universal mass function?

P 08

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In the 1940's Fritz Zwicky argued on statistical grounds that there might be a continuum of gravitationally bound objects in the universe from stars to starclusters and galaxies all the way up to the largest clusters of galaxies. This conjecture has never been put on a test. We report on a first attempt to construct a universal mass function that extends from dust particles to asteroids and planets, brown dwarfs, stars and stellar remnants, multiple stars, starclusters, galaxies, groups and clusters of galaxies, covering a range in mass of more than 50 orders of magnitude – from below a gram to $10^{16} M_{\odot}$. As a by-product of this work we establish a mass function of stars *and* stellar remnants based on simple assumptions on the fate of stars. A universal mass function is difficult to interpret, as different physical processes are at work on different scales, but it can be viewed as a valuable piece of cosmography.

On CO cooling in dense molecular clouds

P 09

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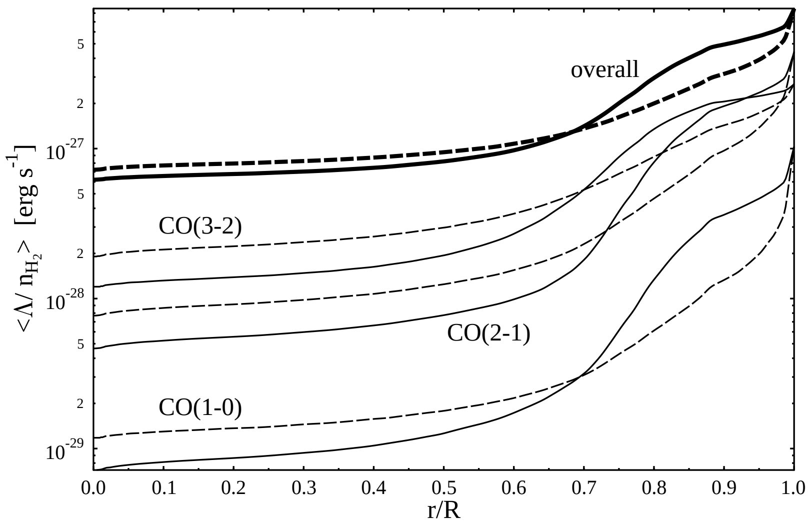
For star formation to take place, the compressional and gravitational energy of the cold and dense cloud cores has to be removed. The by far most important cooling mechanism is the transport of energy by radiation. However, the radiative cooling rates can only be obtained if the chemical composition and the excitation conditions in the cloud are known. This means, that it is necessary to solve the full radiative transfer problem, in order to derive the net flow of energy in the case of NLTE. For the cold and dense molecular cloud cores, the most important cooling mechanism is line emission of CO. Besides H_2, CO is the most abundant molecule in the interstellar medium and its low rotational levels are easily excited even for very low gas temperatures.

In our present work, we study the influence of radiative transfer effects on the radiative cooling by CO. We describe the variation of the turbulent velocity in a statistical sense assuming the variation of the velocity along each line of sight to correspond to a continuous Markov process. Caused by the stochastic nature of the velocity, the intensity becomes a stochastic variable, too. As a consequence, the ordinary radiative transfer has to be replaced by a generalized transfer equation of Fokker-Planck type. It turns out that the ratio of the correlation length of the turbulent velocity to the meen free path of photons has great influence on the intensity of the emitted lines and thereby on the cooling rates of the gas (cf.[1,3,2]).



In the above figure, we give as an example the ^{12}CO cooling rates as a function of the distance from the cloud center for an isothermal cloud model with $T_{\rm gas} = 10$ K, $n_{\rm H_2,cen} = 10^4 \rm cm^{-3}$ and a turbulent velocity field $\sigma_{\rm turb} = 5\, v_{\rm therm}$. The correlation lengths are 10^{16}cm (solid lines) and 10^{18}cm (dashed lines), respectively.

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An unbiased search for molecular clumpuscules

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I present the first results of an unbiased large scale survey for molecular clumpuscules. Small-area molecular structures resempling those clumpuscules, proposed by Pfenniger and Combes (1994) as candidate for baryonic dark matter, had recently been detected (Heithausen 2002, 2004) in an area where the shielding is too low for them to survive for a long time.

The area surrounding these structures has now been surveyed using the FCRAO 14m telescope in the CO (1-0) transition. The field covered is 20′ by 20′. 3 new small molecular structures have been detected. Details can be seen in Fig. P 10. Note the very low intensity of the structures, which makes it very unlikely to detect them in the large scale CO surveys conducted to map the molecular gas of the Milky way. The structures move with a similar LSR-velocity as the surrounding HI gas. The velocity difference between the individual structures is much larger than that in a galactic cirrus cloud on comparable size scale.

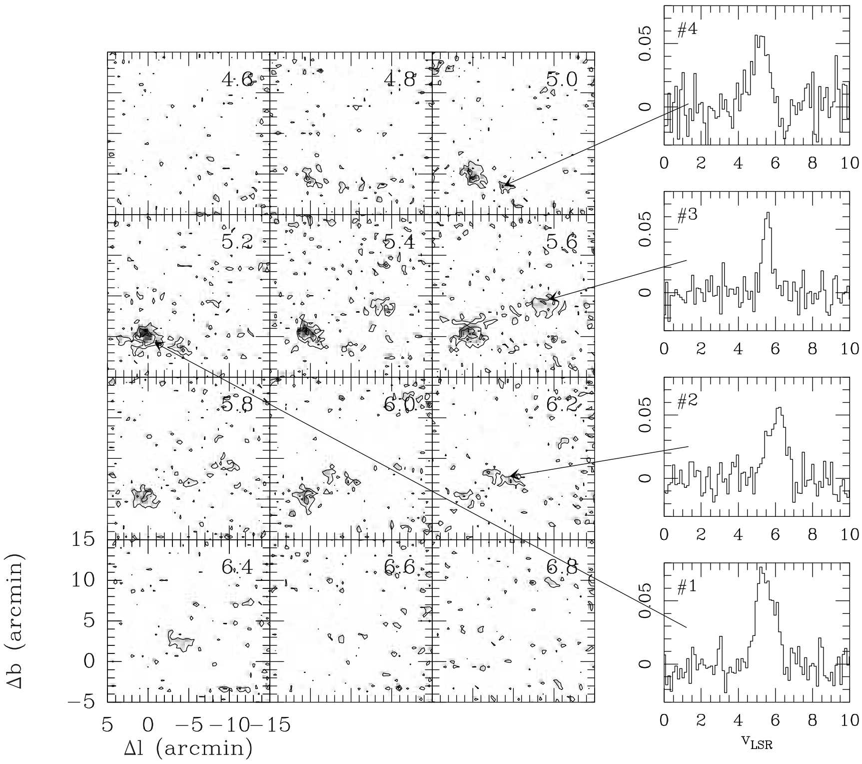

Fig. P 10. CO channelsmaps of the unbiased large-scale mapping with the FCRAO 14m telescope

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Pfenniger, D., Combes, F., 1994, A&A 285, 94.
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Vertical structure of accretion disks

P 11

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We present first results of a newly developed numerical code for the vertical structure of massive viscous disks, applied to accretion in active galactic nuclei and in protostellar systems. Instead of the height above midplane the code uses the total flux as a natural vertical coordinate. In addition to the physical properties of standard accretion disks, it takes care of self-gravity (both in vertical and radial direction) and the disk-equivalent of the Eddington limit.

A New Data Acquisition System and User Control Program for CCD Cameras at " Hoher List" Observatory.

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User Control and data acquisition of CCD camera systems at "Hoher List" Observatory (e.g. HoLiCam) are based on the DOS operating system and the ISA- bus. It has to be replaced, as support for these systems is diminishing rapidly. The new data acquisition system uses the USB2.0 bus in order to transfer the image data to a Linux PC. Our CCD Control Unit communicates with the host computer using a standard RS 232 interface for exchange of command and status information. The image-data is sent in a serial way through a hand tailored interface, that is run asynchronously.

An interface based on a Xilinx XC95108 was developed in order to batch the serial data into 16 bit data words, which are fed into a Cypress FX2 chip, that packetises them to 512 byte USB packets and sends them to the host computer. Using its Auto-In mode no programming of the microcontroller except for initialization and buffer reset was necessary. It turned out that the simple to use `libusb` library, that serves well for firmeware upload to the FX2, didn't receive the USB packets reliably, especially at high data rates. Writing a kernel driver instead, we reached a reliable trasfer of up to 15MBytes/s, running a homenumbergenerator for several hours. We allocate enough blocks of memory to store the entire image and pass them to the USB kernel-subsystem, which automatically calles back as soon as they are filled with the received data.

A graphical user interface was developed based on the GTK library, using the graphical development tool Glade. It took considerable efforts to display data collected by background processes, as GTK does not natively support them. The data is stored into FITS-files using the cfitsio library. There is ongoing development in order to include a remote control. The public domain "INDI" protocol library provides functions to transfer data between hardware drivers and user interfaces in a network transparent way, and thus seems suitable for this purpose.

Tracing the Photon Dominated Region around DR21 with CO, CI, CII, and OI emission

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Young intermediate mass and massive (M>8 $M_\odot$) stars generate enough far-UV flux to create a Photon Dominated Region (PDR) in the surrounding quiescent molecular gas. Numerous theoretical (e.g., Tielens & Hollenbach 1985, Sternberg & Dalgarno 1989) and observational studies (e.g., Kramer et al. 2004, Schneider et al. 2003) revealed the layered structure of a PDR: the ionizing photons first create a zone (at a visual extinction of $A_v \sim 1^m$), where hydrogen and atomic oxygen are neutral and atomic carbon ionized. Further inside the probably clumpy molecular cloud, the UV radiation leads to a warm molecular zone of high excitation, where carbon becomes neutral ($A_v \sim$2–5^m), followed by the cloud core ($A_v \sim 10^m$) with carbon contained in CO molecules. The most important cooling lines for the gas are the CII 158 μm, OI 63 and 145 μm finestructure lines, the CO rotational lines, fluorescent H_2 lines, dust continuum and PAH features. Most of these PDR tracers emit copiously at submillimeter and far-infrared wavelengths and are used to determine the physical parameters of the gas, in particular to study the influence of massive stars on their environment.

In this paper, we present maps and single pointings of a large number of PDR tracers (CII, OI, CI, and CO observations at KOSMA-3m in conjunction with ISO/LWS and KAO) of the DR21 region. We follow the classical approach to study PDRs by combining observed line intensities and ratios from PDR tracers with theoretical calculations in order to reproduce the observations by varying the hydrogen density and intensity of the UV radiation field. We employ the revised PDR model for spherically symmetric clumps by Störzer, Stutzki, & Sternberg

(1996). The presence of a lower-density interclump medium is taken into account as a purely absorbing, thus preshielding, H_2 and CO column. This reduces the photodissociation of CO in the clumps and agrees well with observed CI to CO line ratios.

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Schneider et al. 2003, A&A, 406, 915
Störzer, Stutzki, & Sternberg, 1996, A&A, 310, 592

Time resolved spectroscopy of CI Aql

P 14 MARCO O. JESACHER, STEFAN KIMESWENGER

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CI Aql is one out of only 9 to 10 members of the class of recurrent novae: U Sco, V394 CrA, RS Oph, T CrB, V745 Sco, V3890 Sgr, T Pyx, CI Aql and IM Nor. CI Aql was found to be an eclipsing binary system. Recent improvement of the light curves lead to a period shift and thus to a direct determination of the outburst mass during the 2000 event (Lederle & Kimeswenger 2003). It is, to our knowledge, the only system of that type investigated photometrically in such detail before and after an outburst. The photometric models may restrict the nature of the objects involved, but to obtain the real nature of the components spectroscopic investigations during quiescence are needed. Up to now only a few short shots are available (Greiner et al. 1996; Mennickent & Honeycutt 1995) leading to very divergent results.

The target was investigated spectroscopically at a short timescale - both to reveal the nature of the individual components of the system as well as to investigate the emission processes of the short timescale variations. While the first can be done best by first fixing the secondary component during the primary minimum, the latter is best investigated during a phase of 0.6 to 0.9, where the impact region of the accretion is projected best towards the observer. Finally the phases 0.1 to 0.25 is completely dominated by the irradiated part of the secondary star. The redistribution of energy along the secondary can be investigated independently here.

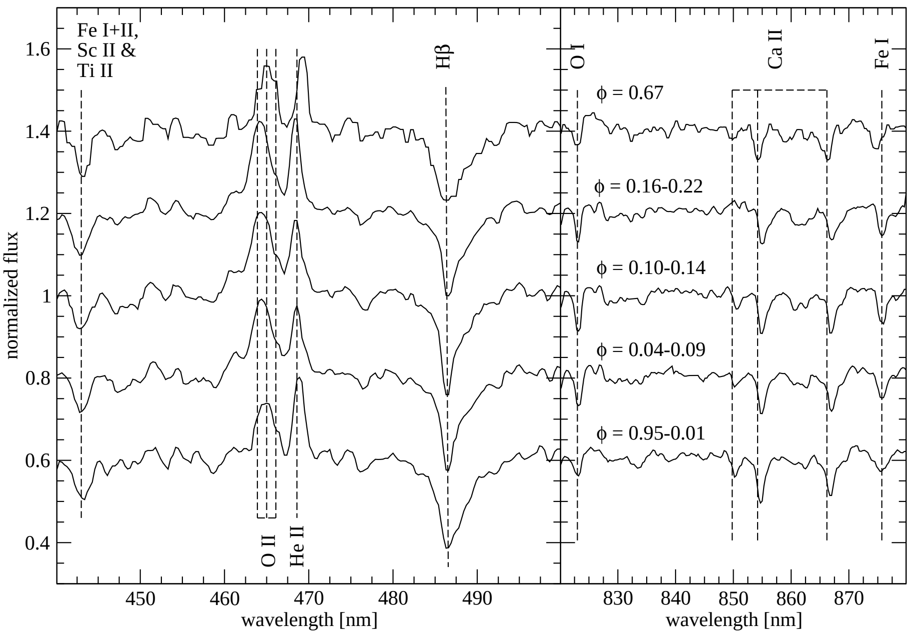

Fig. P 14. Spectroscopic “snapshots“ at different photometric phases of the binary system. Clearly visible are the changes of the intensity and positions of the lines.

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Empirical Color Transformations between SDSS Photometry and Other Photometric Systems

P 15

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We present transformations between the *ugriz* photometry system of the Sloan Digital Sky Survey (SDSS) and other photometric systems. The SDSS is mapping one quarter of the sky in these five passbands and will provide magnitudes for more than 100 million objects. The photometric catalogs of the SDSS offer a wealth of astrophysical information in a relatively new photometric system and can be used as local calibrators for other imaging observations. This makes it particularly important to be able to convert between the SDSS *ugriz* system and other photometric systems.

The SDSS photometric system as originally devised is described in Fukugita et al. (1996), where also synthetic color transformation to the standard Johnson-Cousins system are provided. These transformations are based on the envisioned passbands and on stellar spectroscopic libraries. Here we present empirical transformations based on stars actually measured by the SDSS with the SDSS survey camera and the actually used SDSS filters. The SDSS survey areas comprise a number of areas that were established as standard fields in other photometric systems. For instance, several of the equatorial standard fields of Landolt (1992) and of the fainter CCD standard stars of Stetson (2000) are included.

We used this overlap to calculate transformations between the *UBVRI* Johnson-Kron-Cousins system and the SDSS system. For the B,V,R and I bandpasses 2459 stars from the Stetson sample were used. The position of the bandpasses led to four equations, for all of which we found linear dependencies. Because the Johnson U bandpass was not measured by Stetson, at least not in the fields also observed by SDSS, we used stars from the Landolt sample. A total of 76 common stars were used to compute a transformation equation. Here also the assumption of a linear dependence resulted in the least scatter.

Furthermore, we established color transformations between the RGU system and the SDSS system. We used 982 stars from the Basel high-latitude field star survey (Buser et al. 1998). The RGU passbands resemble those of their SDSS counterparts. Two linear color equations were fitted to the data.

V4332 Sgr

P 16

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In 1994 V4332 Sgr underwent a mysterious eruption. Somehow its fast evolution towards a red giant star was, lacking alternative classifications, connected to the red variable M31 RV, which had its eruption in 1988. The red eruptive variable V838 Mon draw in February 2002 the attention back to its ’older twin’ V4332 Sgr (Kimeswenger et al. 2002). Post outburst photometry and spectroscopy from 2002 and 2003 show that the object stopped it’s decline. The new high quality spectra provide a supplement and completion to the data around the outburst given by Martini et al. (1999). It thus allows theorists to give new boundaries for modelling of this unusual object.

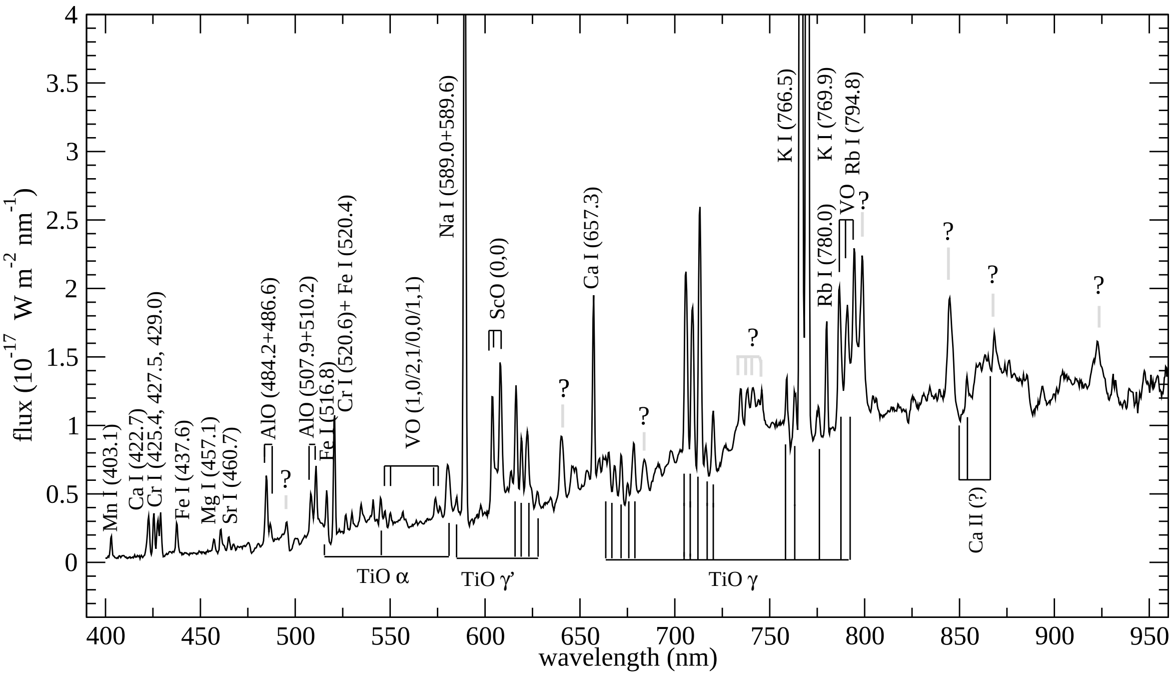

Fig. P 16. The spectrum of V4332 Sgr reveals one of the most unusual optical spectra. The NaI (589.0 + 589.6 nm) and the KI (766.5 and 769.9nm) are truncated in order to see all the weaker features. The main features are marked. Strong, but unidentified features are marked with grey tics.

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Low rotation velocities of white dwarfs from the CaII K line

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Narrow CaII lines have been found in a large number of DA white dwarfs by Zuckerman & Reid (1998), Zuckerman et al. (2003), and Koester et al. (2005). In this paper we use the rotational broadening of these lines to determine projected rotation velocities v sin i, which up to now was only known spectroscopically from the core of Hα and from different methods (splitting of pulsational eigenfrequencies, variable polarization in magnetic objects) in a few cases.

All 38 objects studied show very low rotation velocities, which in 28 objects is even compatible with zero rotation, with very stringent limits of a few km/s. Among the exceptions are a known ZZ Ceti variable and two stars which fall in or or near the instability strip according to their atmospheric parameters. It is well known since the work of Koester et al. (1998) that these variables show abnormal line profiles, which are very likely not due to rotation, but remain unexplained presently.

The results confirm previous findings (e.g. Heber et al. 1997; Koester et al. 1998; Karl et al. 2005) that white dwarfs are very slow rotators, and set even more stringent upper limits. A simple statistical consideration of the progenitors of these white dwarfs clearly demonstrates that the angular momentum of the stellar core cannot be preserved completely between main sequence and final stage.

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E-Learning in Astronomy

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Since research in astronomy consists to a large part of work with a computer (e.g. control of telescopes, image processing systems, N-body simulations, calculations of models) it is evident that higher education in astronomy should also include e-learning, teaching and learning with the support of software. However, e-learning cannot only used for domains in astronomy in which computers are needed. The transfer of factual knowledge and exercises can also be effectively supported. E-learning in general has a lot of advantages which can lead to a higher quality of the learning process: place and time for learning is not fixed, there is no time- and cost-consuming travel to lectures or practical courses, speed of learning is not fixed, theoretical knowledge is transferred to practical knowledge by exercises, immediate automatical analysis of exercises is possible, experiences with software tools can be gained, and remote use of instruments is possible. In former times there was also the idea that e-learning could save expenses for instructors. However, this is wrong because in the e-learning process authors, tutors, and coaches are still needed.

The above given definition of e-learning is very common (cf. Baumgartner 2003) and contains locally installed software on a computer (CBT = Computer Based Training) (e.g. CD-ROM or downloaded software from the Web), learning via Internet (Web-based learning), and learning using mobile or handheld technologies (mobile learning = M-learning). While M-learning is based on very new technologies and is up to now not used in astronomy there are a lot of applications for Web-based learning and CBT in astronomy. Thereby Web-based learning is more attractive for school and university students and therefore conducive to the learning process since possibilities for learning scenarios are larger (e.g. dynamic, interactive, and personalized applications, remote control of instruments, communication and cooperation with people at different places).

E-Learning applications can be divided in five levels defined by the main actions of the learner (cf. Baumgartner 2003). At the first level learners read and receive using e.g. Web-sites or PDF-documents. Such e-learning applications contain only static information and the only use is the transfer of knowledge. At this level there exists a lot of e-learning material in astronomy.
The main actions at the second level are using knowledge and exercising. Applications are standard tests (e.g. multiple choice, correlations, fill-in-the-blank) and drill & practice including programs for automatical correction of solutions. Such exercises for fields of astronomy are very common (e.g. course with WebCT: http://www2.oakland.edu/elis/WSO_demo.cfm).
At the third level learners explore using simulations or animations. For astronomy there exists many interactive programs as applets containing applications in all fields of astronomy: from the solar system over star spectra and galaxies to cosmology (s. http://www.astro.ruhr-uni-bochum.de/luett/elearning.html).
If learners have to decide and to select how a complex problem is solved the fourth level is reached. Solutions of such problems could be commands for an image processing system, natural language answers, or graphical solutions. These solutions can be corrected by a human tutor or a program (which can be very complicated and use methods of the artificial intelligence). An alternative is the presentation of the model solution without any correction. Such e-learning applications are very rare in astronomy and there is no application with an intelligent automatical analysis of complex solutions. Hands-On Universe (http://wwwlb.ph.tum.de) (although not constructed as e-learning application) gives some complex problems but without automatical analysis.
At the last level learners research, develop and cooperate with other learners in virtual or remote labs, or CSCL (computer supported cooperative learning) environments using shared applications (e.g. Wiki, shared whiteboard), software tools, and connections between real instruments and Internet. There exist only very few of such e-learning applications. The MONET project (http://www.uni-sw.gwdg.de/∼hessman/MONET/) gives access to robotic telescopes for school and university students via Internet and has therefore elements of this high e-learning level. The Sky Watch project has more elements of this high level (http://www.sky-watch.org). It includes for an European astronomical contest robotic telescopes, collaboration tools, and experts as online-coaches

for self defined projects.
Experiences show that students like e-learning at the level 3, 4, and 5. However, most applications in astronomy have the levels 1 and 2 because such applications are relatively easy to realize.

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RR Lyrae stars: Kinematics, orbits and z-distribution

P 19

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RR Lyrae stars in the Milky Way are good tracers to study the kinematic behaviour and spatial distribution of older stellar populations. Recently, a well documented sample of 217 RR Lyr stars with $V < 12.5$ mag was established (Maintz 2005, A&A, submitted). Those stars in this sample for which accurate distances and radial velocities as well as proper motions from the Hipparcos and Tycho-2 catalogues are available, have been used to reinvestigate the structural parameters of the RR Lyra distribution in the Milky Way.

The kinematic parameters of the RR Lyrae stars allowed to calculate the orbits of the stars. Nearly 1/3 of the stars of our sample has orbits staying near the Milky Way plane. Of the 217 stars, 163 have halo-like orbits fulfilling one of the following criteria: $\Theta < 100$ km s^{-1}, orbit eccentricity > 0.4, and normalized maximum orbital z-distance > 0.45. Of these stars roughly half have retrograde orbits. The z-distance probability distribution of this sample shows scale heights of 1.3 ± 0.1 kpc for the disk component and 4.6 ± 0.3 kpc for the halo component (Maintz & de Boer, 2005, A&A, submitted).

With our orbit statistics method we found a (vertical) spatial distribution which, out to $z = 20$ kpc, is similar to that found with other methods. This RR Lyrae distribution found is also compatible with the ones found for the blue HBA halo stars (Kinman, Suntzeff, & Kraft, 1994, AJ, 108, 1722) and the sdB halo stars (Altmann, Edelmann, & de Boer, 2004, A&A, 414, 181).

The circular velocity Θ, the orbit eccentricity, orbit z-extent and [Fe/H] are employed to look for possible correlations. If any, it is that the metal poor stars with [Fe/H] < 1.0 have a wide symmetric distribution about $\Theta = 0$, thus for this subsample on average a motion independent of disk rotation.

We conclude that the Milky Way possesses a halo component of old and metal poor stars with a scale height of 4-5 kpc having random orbits. The presence in our sample of a few metal poor stars (thus part of the halo population) with thin disk-like orbits is statistically not surprising. The midplane density ratio of halo to disk stars is found to be 0.16, a value very dependent on proper sample statistics.

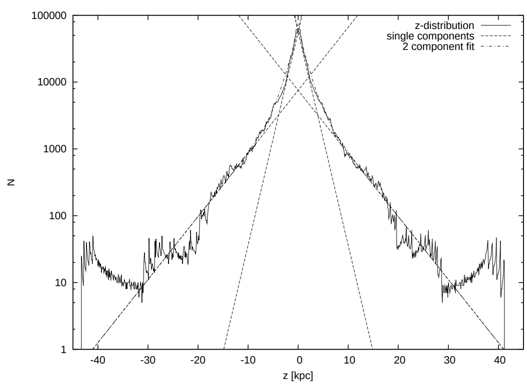

Fig. P 19. The probability of the z-distance distribution of all RR Lyrae stars of the sample, obtained by summing the individual RR Lyra $N(z)$ statistics for time steps of 1 Myr. The dashed lines show the two-component fit of the logarithmic distribution based on the scale heights $h = 1.3 \pm 0.1$ kpc for the "disk component" and $h = 4.5 \pm 0.3$ kpc for the "halo component". Figure from Maintz & de Boer (2005, A&A, submitted).

New developments on the field of chemically peculiar stars in the milky way and the LMC

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During the IAU Symposium No. 224 (July 2004) we, the Vienna Δa Research Group, have presented our ongoing research projects. Important contributions have been attained since: In collaboration with I.Kh. Iliev (Rozhen, Bulgaria), O.I. Pintado (Tucuman, Argentina) and A. Claret (Granada, Spain) six galactic open clusters were surveyed for the presence of chemically peculiar (CP) stars using the photometric Δa index. This brings the record of our photometric survey (both photoelectric and CCD) to 65 published clusters. The aim of this survey is to identify conditions which favour the existence of peculiar stars (especially those with strong global magnetic fields), and complementary those which inhibit their formation in open clusters. In the present paper, with NGC 3105 so far the most distant cluster (8.5 kpc from the Sun) in our Galaxy was observed this way and the detection of one CP star was reported. Again with Pintado and Claret, the Δa search for peculiar stars was continued in the Large Magellanic Cloud (LMC) in two fields: one centered on the open cluster NGC 1711 and one on the typical bulge population. Although the frequency of CP stars is slightly higher than in the region of the LMC cluster NGC 1866 as found in Maitzen et al. (2001, A&A, 371, L5), it is significantly lower by approximately 50% than in our Galaxy. After the initialising paper by Pöhnl et al. (2003, A&A, 402, 247) on the evolutionary status of magnetic CP stars in open clusters, the appearance of these stars in the solar neighbourhood (up to 200 pc) has been investigated in an analogous way. We are able to show that the phenomenon of magnetic fields present in upper main sequence CP stars occurs continuously already from the zero age main sequence between 1.5 and 4.5 solar masses. We report further activities concerning the modelling of the 5200Å-region, especially for hot CP stars, the behaviour of B-type stars in the Δa system, the search for CP2 analogues on the blue horizontal branch of globular clusters and the finalisation of photoelectric photometry in open cluster using Δa photometry.

Large-scale CO Mapping of the CEPHEUS Giant Molecular Cloud using KOSMA

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We present results of a large-scale CO survey of the Cepheus Giant Molecular Cloud at 730 pc distance. For the first time we observed a region of 3.6 deg^2 in Cepheus in CO (3-2) and ^{13}CO (2-1) at resolutions of 82$''$ and 130$''$ respectively using the KOSMA 3m submillimeter telescope. For the analysis we additionally used the complementary CO (1-0) dataset observed as a part of the outer Galaxy Survey using FCRAO by Heyer et al. (1998).

The Cepheus Giant Molecular Cloud is located next to the Cepheus OB3 association and shows bright emission features, which are regions of ongoing star formation (Cep A), a quiescent and very broad region (Cep C) and regions with embedded and obscured young stars and objects (Cepheus B, E, F) (see figure). We observed CO (3-2) and ^{13}CO (2-1) to get more knowledge about the structure of the densities and temperatures in the whole Cepheus GMC.

Assuming Local Thermodynamical Equilibrium and ^{12}CO to be optically thick we calculated the excitation temperature of the whole region from the ratio of the velocitiy integrated intensity of CO (3-2) and CO (1-0). The estimated excitation temperatures lie between 10 K and 60 K over the entire cloud.

We further calculated the H_2 column density distribution in the entire region using the calculated excitation temperature , the integrated ^{13}CO (2-1) intensity and a [CO]/[H_2] abundance ratio of 4.7$\cdot$10^5. The H_2 column densities range between 10^{20} and 10^{23} cm^{-2}.

We plan to derive the kinetic temperature, column density and volume density using an escape probability based radiation transfer model. We will further constrain the volume density distribution in the region, using the available intensity of the UV radiation field and the observed line intensities as inputs to a more physically realistic model for Photon Dominated Regions (Röllig et al. 2005).

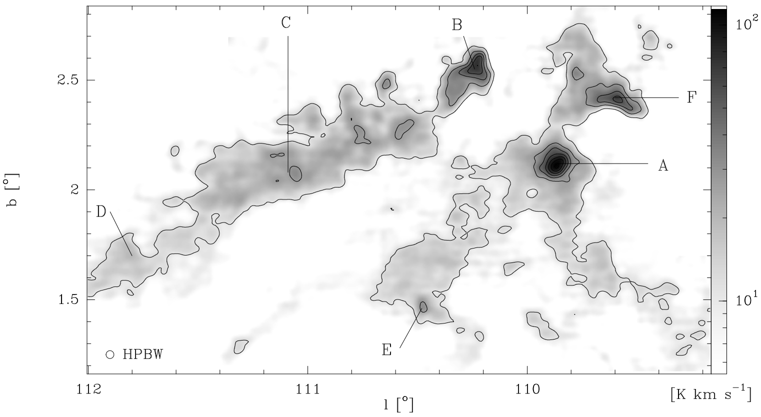

Fig. P 21. CO (3-2) map of the Cepheus GMC, velocity integrated intensities ($T_{\rm mb}$) of CO (3-2), integrated between [-18,3] km s^{-1}, contours range from 11 to 113 by 17 K km s^{-1} and smoothed to a resolution of 130″

HoLiCS II - The "Hoher List Control System" II

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In the last few years we have upgraded the "Hoher List Control System" (`HoLiCS`) to comply more advanced requirements concerning the automated operation of the 1m Cassegrain (f/14.5) telescope of the Hoher List observatory. This includes improvements of the control software as well as installation of new hardware and enlarged use of micro-controller operated peripheral hardware.

The main control software written completely in C++ was developed further to be more modular and allow easy extension with new software components. We also updated the user interface to be more clear.

New hardware is connected to the control PC via a CAN bus interface. We stick to industrial standards (CANOpen) to allow for easy further extensions. Micro-controllers now operate e.g. dome slit, lamps, mirror cover and sensors. We currently integrate a weather station including a rain sensor to warn users and optional close the dome automatically.

The poster explains the upgraded system design and our new integration strategies as well as our future plans.

88 GHz “Holotransmitter“ for the Nanten2 Telescope

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Holography is one method to optimize the surface of a dish of a radiotelescope. We have built a Holotransmitter to operate at 88 GHz. The transmitter is for the new Nanten2 telescope which moved to Chilean Atacama desert in 2004. It is equipped with a new 4m dish. If the surface accuracy would reach 20 micron the telescope could operate up to 880 GHz. For this first tests and surface optimization 2 receivers from the Seoul National University running at 88 GHz were installed at the telescope.

The Holotranmitter had to be placed a few kilometers away a little bit higher than the telescope. Nanten2 is at 4800m not far away from ALMA/APEX and the site for the transmitter is at 5170m. Beause at this altitude there is no infrastructure the power for the transmitter has to be delivered by solar panels.

The final demands for the Holotransmitter were:

- Transmit frequency 88 GHz,
- Low power consumption,
- Optical status control,
- Standalone, plug and play,
- No mechanical adjustments,
- Mechanically and electrically stable for outdoor conditions,
- Survive storm, rain, snow, heat and cold

Based on a design which was used on the Kleinmatterhorn for the Gornergrat telescope the transmitter is now equipped with a Gunn Oscillator running at 88 GHz and delivering about 20 mW of Power in a pyramidal horn. The Gunn is locked to a DRO-Oscillator with a harmonic mixer and a PLL. The PLL was designed and developed at the Radioastronomisches Inst. Univ of Bonn. The PLL unit is controlled by a microcontroller (80537) which is responsible for search, tune and lock. The temperature controllers for Gunn, DRO and the housing are also connected to the microcontroller. The status of the whole system is analysed and can be seen as a blink code via a flashlight in the night. For a detailed monitoring of operation parameters an interface to a Palm Pocket PC is also supported.

Since end of February 2005 the transmitter is working standalone in the Atacama/Chile at an altitude of 5170m. Thus the 88 GHz “Holotranmitter“ from Bonn gave “First Light” to Nanten2.

Comet Astrometry – Tracing the last witnesses of the solar system’s childhood

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In September 2004, we used the 1m-Cassegrain telescope at the observatory “Hoher List” to detect the objects chosen from an official list of already discovered and catalogued comets. Our job now was to find these comets and identify them within the field-of-view (FOV) where they were supposed to be at the moment of observation. After being sure that the comet concerned was found clearly on the CCD exposure, we were able to calculate its position by reference stars. With several images of the same object, we were further able to follow its trajectory and, by that means, confirm the so far given.

Besides, this procedure is an outstanding practice for collegiate work at telescopes and for the reduction and evaluation of CCD pictures, as well as it is a fundamental basis for later exploration of these “key fossils” in order to understand more about the beginning and the formation of our solar system.

Considerations on the spectral appearance of M-type brown dwarfs

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As prominent representatives in the substellar regime brown dwarfs are still in the focus of the scientific community. The spectral appearance of these objects has been extensively studied in the last decade (e.g. Allard et al. 2001, Tsuji 2002, Allard et al. 2003) using techniques provided by the classical theory of stellar atmospheres. However, the chemical composition of such substellar objects is rather complex and phase-transitions between gas and solids, maybe liquids, have to be taken into account appropriately.
In this study, we present model-calculations of brown dwarfs atmospheres, especially those of the M-spectraltype (Allard et al. 1995) which do not show significant appearance of dust. Assuming local thermodynamic equilibrium, frequency-dependent radiative transfer calculations for plane-parallel brown dwarf atmospheres under the condition of hydrostatic, chemical and radiative equilibrium were realised. To obtain the desired accuracy for the energy conservation a modified Unsöld-Lucy method was applied, while the radiative transfer was solved via an improved Feautrier method.

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Tsuji, T. 2002, ApJ 575, 264

Photon Dominated Region Modelling of Barnard 68

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A Photon-Dominated Region (PDR) model is presented for the line emission of the Barnard 68 dark globule. With a roughly spherical morphology and a previously determined density profile, Barnard 68 is an ideal test-bed for spherical PDR models in low-UV radiation fields. This allows the study of the impact of the chemistry in the predicted line emission. We compare the spherically symmetric PDR model by Störzer, Stutzki & Sternberg (1996) to observations of the ^{12}CO J = 2→1 and J = 3→2 rotational transitions as well as the [CI] $^3P_1 \rightarrow ^3P_0$ fine structure transition. The analysis shows that Polycyclic Aromatic Hydrocarbons (PAH) have to be included in the chemical network of the PDR model in order to explain the observed [CI] and CO emission. The line intensity of the best-fit model reproduces the observations within ∼30%. Additionally, predictions for the [CII] $^2P_{3/2} \rightarrow ^2P_{1/2}$, [CI] $^3P_2 \rightarrow ^3P_1$, ^{12}CO J = 5→4, and J = 4→3 transitions are presented. Observations of these transitions with future instruments (APEX, NANTEN2, HERSCHEL, SOFIA) will allow to test our PDR model of Barnard 68.

A New Versatile Multichannel CCD-Controller for BUSCA.

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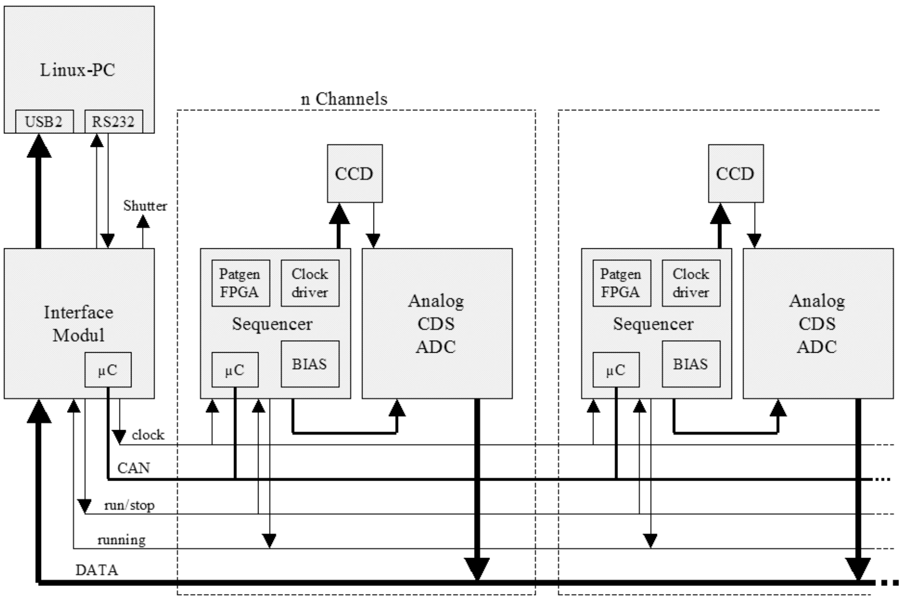
Based on our long experience with various CCD detectors and detector systems, and own-build as well as adopted CCD controllers we are developing a new CCD controller. The primary goal is to replace the outdated CCD controller system for BUSCA the *Bonn University Simultaneous Camera*, a user instrument at the Calar Alto 2.2m telescope. As we will be resposible for this controller in the future we decided to do our own development, such that we have a system that can be easily maintained and upgraded by ourselves. Given the limited budget of a university institute we aim at a high end/low cost solution. Some of the basic properties and performance parameters are:

- Synchronous multichannel-channel read out (4 channels minimum).
- Number of CCD channels scalable.
- High speed read out, up to 1Mpix /sec.
- 16 or 18 bit digitization.
- Progammable bias and clock voltages.
- Progammable pattern, 20ns timestep, 15 Bit/channel.Parallel clock patterns can be shaped.
- Up to 100 read out configurations (binning, windowing, multiple windows) can be preloaded.
- A "factory default" read out mode (programmable) which is available after power on.
- Highly compact sequencer design. Pattern storage and generation in a single FPGA.



A new concept for the pattern generation was realized. A *sequence processor* was developed as a FPGA core. The patterns consist of a set of instructions residing in the FPGA's RAM. The instruction set is very "reduced" but it does allow to define sophisticated patterns in a very compact manner e.g. by means of a loop instruction. Each instruction takes one 50MHz cycle (i.e. 20ns) and does consist of a 16Bit word. With an OUT-instruction 15 Bits are switched synchronously (20ns resolution). A *sequence editor* with a debug/emulation mode and graphical output was developed. All sequencer modules (one per CCD channel) are driven by the same master clock and are started by one common control line. Thus synchronous multi-channel operation is garanteed.

High Precision "Bonn Shutters" for the largest CCD Mosaic Cameras.

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The first *Bonn Shutter* was developed together with and implemented in BUSCA, the *Bonn University Simultaneous Camera*, a user instrument at the Calar Alto 2.2m telescope. The required aperture size was 110mm×110mm a large format that didn't exist among commercially available exposure shutters. We have developed a design that turned out to allow high precision timing control and to be scalable: Two rigid blades operating in alternating directions for successive exposures and a microcontroller based control electronics. Since then *Bonn Shutters* have been developed for various camera systems with apertures ranging up to 370mm×292mm (OmegaCam, ESO/Paranal). The principle of operation is basically the same for all shutters. The key performance parameters are a wide range of exposure times (down to 1msec) and high timing precision which reduces exposure nonhomogeneities to less than 1msec, i.e. less than 0.1% at 1sec exposure time.

As the next generation of wide field surveying telescopes and camera systems has still growing focal planes not only filter formats but also shutter apertures have to grow with them. In addition these are in general fast optical systems and exposure times will be relatively short — minutes or few ten seconds. Thus to minimize any overhead the shutter must have very short idle times. One to two seconds are often required.

We have under development shutter systems for the SkyMapper telescope project (aperture 280mm×280mm) at Siding Spring Observatory and for the One Degree Imager (450mm×450mm) for the WIYN telescope at Kitt Peak Observatory. The most challenging development is that for Pan-STARRS (Panoramic Survey Telescope & Rapid Response System). This is a group of four 1.8m telescopes to be installed at Mauna Kea by the University of Hawaii. It's not only the aperture of nearly 0.5m×0.5m but the shutters shall stop electromagnetic waves in the visual as well as in the radio range providing RF shielding for the detector system, and it is required to be air tight!

High-Resolution Near-Infrared Speckle Interferometry and Radiative Transfer Modeling of the OH/IR star OH 104.9+2.4

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We present near-infrared speckle interferometry of the OH/IR star OH 104.9+2.4 in the K' band obtained with the 6m telescope of the Special Astrophysical Observatory (SAO) in Oct. 2002 and 2003. At a wavelength of λ = 2.12 μm the diffraction-limited resolution of 74 mas was attained. The reconstructed visibility reveals a spherically symmetric, circumstellar dust shell (CDS) surrounding the central star. The visibility function shows that the stellar contribution to the total flux at λ = 2.12 μm is less than 50%, indicating a rather large optical depth of the CDS. The azimuthally averaged 1-dimensional Gaussian visibility fit yields a diameter of 47±3mas (FHWM), which corresponds to 112±13 AU for an adopted distance of D = 2.38±0.24 kpc. To determine the structure and the properties of the CDS of OH 104.9+2.4, radiative transfer calculations using the code DUSTY were performed to simultaneously model its visibility and the spectral energy distribution (SED). Since OH 104.9+2.4 is highly variable, the observational data taken into consideration for the modeling correspond to different phases of the object's variability cycle. This offers the possibility to derive several physical parameters of the central star and its CDS as a function of phase. For instance, according to our final model the effective temperature of the central star increases from $T_{\rm eff}$ = 2250 K at minimum phase (ϕ=0.5) to $T_{\rm eff}$ = 3150 K at maximum phase (ϕ =

0.0), while the stellar radius decreases from $R = 730\,R_\odot$ at ϕ = 0.5 to 675 $R_\odot$ at $\phi = 0.0$. For the CDS, we found that the inner boundary of the dust shell is located at 8.3 $R_\odot$ at minimum phase and approximately a factor of two further away at maximum phase ($R_{\rm in}/R_\star = 17.5$), and the optical depth at 2.2 μm decreases from 8.5 to 3.5 between minimum and maximum phase. Our detailed analysis demonstrates the potential of dust shell modeling constrained by both the SED and visibilities obtained from interferometric measurements.

A new Doppler image of the weak-line T Tauri star V410 Tauri

P 30

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In order to be able to create a new Doppler image of the spot distribution of V410 Tauri 13 spectra were taken at different rotational phases of the approximately 1.872 days period of the weak-line T Tauri star. The data were acquired on 13 nights spanning 128 days in late 2004 and early 2005 using the Coudé Echelle Spectrograph of the Thüringer Landessternwarte Tautenburg 2m telescope and a 2000 x 2000 CCD detector. The VIS channel was chosen so that a wavelength coverage of 4750 – 7070 Å was obtained.

Furthermore photometry has been measured simultaneously with MONICA at the 80 cm telescope at Wendelstein Observatory and at the 1m telescope at the Michael Adrian Observatory in Trebur.

A Doppler image will be derived using a Maximum Entropy method and several photospheric absorption lines, like e.g. the Ca I line at 6439.1 Å. An image calculated using only this line already shows a spot distribution dominated by a high-latitude spot, further lines are being investigated. This spot seems to be long-lived because it already appears in Doppler images from data taken in 1990 by Joncour, Bertout & Ménard, in 1992 by Strassmeier, Welty & Rice and in 1993/1994 by Hatzes.

The photometry is used to compare it to an artificial light curve derived from the calculated Doppler image to check the quality of the resulting image, while the Doppler image itself is of course compared to previous images of the same star.

Moreover the photometry is taken to investigate if there still is a tentative cycle in the mean V band magnitude with a length of 5.4 yr which was found by Stelzer et al. in 2003 and supposed to be the first tentative detection of an activity cycle on a PMS star.

Improving our knowledge on open cluster radial velocities

P 31

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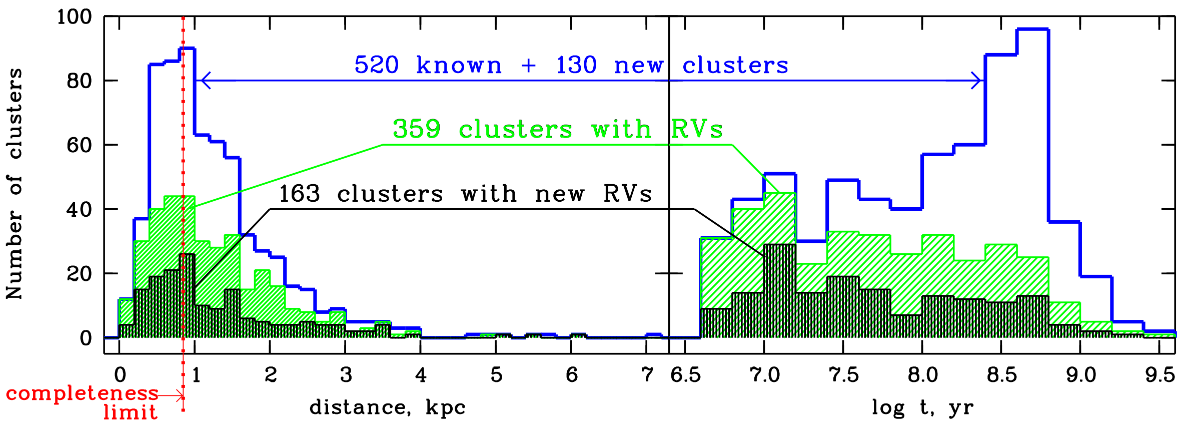
Based on the homogeneous All-Sky Compiled Catalogue of 2.5 million stars (ASCC-2.5; Kharchenko 2001, CDS I/280A), including proper motions in the Hipparcos system, B, V magnitudes in the Johnson photometric system and additional information like spectral types, we have investigated 520 known Galactic open clusters and discovered 130 new ones (Kharchenko et al. 2005a,b, A&A, in press, see also Piskunov et al., this conference). A uniform combined kinematic-photometric cluster membership has been established for all 650 open clusters and new uniform scales of angular sizes, kinematics (average proper motions and radial velocities), distances, reddening and ages have been determined. The mean radial velocities (RVs) have been obtained from cluster members in the Catalogue of Radial Velocities of galactic stars with high precision Astrometric Data (CRVAD; Kharchenko, Piskunov & Scholz 2004, CDS III/239), which is the result of a cross-identification of the ASCC-2.5 with the General Catalogue of Radial Velocities (Barbier-Brossat & Figon 2000, CDS III/213). We have estimated that our sample of 650 clusters is complete within a distance limit of 0.85 kpc. About 260 clusters are located within that limit. Open cluster RVs are generally not well determined in comparison to their proper motions. According to the on-line cluster list of Dias et al. (http://www.astro.iag.usp.br/˜wilton/), RVs have been published for only 240 of about 1700 known clusters in the Galaxy. Moreover, these data are very inhomogeneous: sometimes the RV of a cluster is taken from measurements of only one star, sometimes the rms errors reach 30 km/s, and some authors did not give any information on the accuracy at all. Only 196 clusters of our sample are listed with RVs in Dias et al., the Lund Catalogue by Lyngå (1987, CDS VII/92) and in Ruprecht et al. (1981, CDS VII/101A). On the basis of our membership determination, we were able to revise the RVs for 159 clusters. The mean difference between "old" and "new" measurements is $\overline{RV_{old} - RV_{new}} = 0.36 \pm 0.88$ km/s. Additionally, for 94 known clusters and 69 newly detected clusters, RVs have been determined for the first time. As a result, 359 open clusters of our sample (55%) have RV estimates. As can be seen in the right part of the figure, the availability of RVs for our sample is biased towards younger clusters: 75% of clusters younger than $\log t = 8.3$ have RVs, whereas among older clusters only 31% have RVs measured. Even for close clusters, located within the completeness limit (left part of the figure), RVs measurements are available for 57% only. The lack of RVs does not yet allow us to compute space motions and to study in more detail the kinematics of some individual clusters and of newly identified open cluster complexes like the 'Hyades+Praesepe group', OCC4 (Piskunov et al. 2005, A&A, submitted, see also Kharchenko et al., this conference). The situation will considerably improve when the RAVE programme (Steinmetz, 2003, ASPC, 298, 381), including some dedicated observations in the Galactic plane, will be completed in the next years. RAVE observations are currently under way for more than 1500 members of about 100 open clusters in 12 selected fields.



Distribution of the open clusters in our sample vs. distance from the Sun (left panel) and vs. age (right panel).

The Distribution of MSX Infrared Dark Clouds in the inner Milky Way

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Recent high resolution surveys with the ISO and MSX satellites have revealed a large number of Galactic clouds with significant extinction in the mid-infrared. These infrared dark clouds (IRDCs) are characterized by their high masses, high column densities, and low temperatures, which makes them interesting candidates for clouds in the earliest stages of star formation. Little is known, however, about their origin and distribution in the Galaxy. We use mid-IR data acquired by the MSX satellite mission to identify and catalog IR dark cloud and core candidates in the first and fourth Galactic quadrants using a median filtering technique applied to the images. The catalog contains ~ 12000 objects. Their distribution is concentrated around the Galactic mid-plane and traces prominent bright star forming regions.

Selected high contrast IR dark clouds in the first Galactic quadrant are correlated with ^{13}CO emission from the BU-FCRAO Galactic Ring Survey (GRS), a high resolution survey of ^{13}CO emission in the inner Milky Way. With the GRS it is possible to spectroscopically determine distances to the IR dark clouds and to derive physical parameters, such as sizes and masses, of the dark cores and their parental molecular clouds. Based on morphological correlation of mid-IR extinction and GRS ^{13}CO emission in velocity channel maps, we assign radial velocities to the IR dark clouds throughout the first Galactic quadrant. Assuming a flat rotation curve with ($R_\odot$, v_0)=(8.5 kpc, 220 km s^{-1}) and that the clouds are at the near kinematic distance, we break the distance ambiguity and determine their location in the Galaxy.

We selected a total of 375 dark clouds in the GRS coverage of the first Galactic quadrant with contrasts higher than 20% and sizes larger than $1'$. Of these, 318 have clean morphological matches with GRS molecular line emission in distinct velocity channels. The remaining dark clouds are either low contrast clouds, have only weak GRS emission counterparts or molecular line emission in more than one velocity channel, or no GRS emission at any velocity. The latter are often found close to bright H II regions and are probably holes in the MSX emission.

The majority of IR dark clouds is found towards the 5 kpc Galactic Ring. High contrast IR dark clouds almost always have bright, extended ^{13}CO emission. Thus, in many cases, they are condensations inside larger Giant Molecular Clouds. Core masses are typically a few 100 to a few 1000 $M_\odot$. We therefore suggest that the condensations in the most massive IR dark clouds represent high mass proto-clusters, or OB-associations in the making.

Was the Early Earth shielded from UV by Ozone produced from the Smog Mechanism?

P 33

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We propose that the photochemical smog mechanism could have produced substantial ozone (O_3) in the troposphere during the Proterozoic, which contributed to UV shielding hence favoured the establishment of life. The smog mechanism proceeds via the oxidation of volatile organic compounds (VOCs) such as methane (CH_4) in the presence of ultraviolet (UV) and nitrogen oxides (NOx). It would have been particularly favoured during the Proterozoic given the very high levels of CH_4 (up to 1000ppm) recently suggested. Proterozoic UV levels were higher compared with today, which would also have favoured the mechanism. On the other hand, Proterozoic O_2 (required in the final step of the smog mechanism to form O_3) was less abundant compared with present times. Further, results are sensitive to Proterozoic NOx concentrations, which are challenging to predict, since they depend on uncertain quantities such as NOx source emissions and OH concentrations. We have performed sensitivity studies with a photochemical model investigating the composition of the early Earth. We varied the initial concentrations of key species important for the smog mechanism (CH_4, O_2, NOx). Finally, we have calculated an overhead O_3 column produced via the smog mechanism, hence discuss its potential to provide an UV shield on the early Earth.

Structure Analysis of the CO data in the Perseus clouds

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We present results of a large-scale CO survey of the Perseus molecular cloud at 350 pc distance using the KOSMA 3-m submillimeter telescope. We have observed about 7.10 square degrees in ^{12}CO 3-2 and ^{13}CO 2-1, which covers L 1455, L 1448, NGC 1333, Barnard 1 (B 1), B 1 east, B 3, IC 348 and B 5.

We used the Δ-variance method (Stutzki et al. 1998) to study the spatial structure of line-integrated maps and velocity channel maps of CO data in Perseus at scales between about 0.15 pc to 2 pc. We determine the spectral index β of the power spectrum for the maps in our survey. The power-law indices of the CO integrated intensity maps of the whole observed region have a very narrow range, between 2.7 and 3.0.

The index significantly varies for different sub-regions in our survey, from 2.6 to 3.6 for ^{13}CO 2-1 and 3.0 to 3.5 for ^{12}CO 3-2, with a trend towards more active star-forming regions showing a bigger power law index.

For the individual channel maps we find steeper power laws (larger β) for line core channels and a gradually decreasing β for the channel maps as a function of velocity difference to the line center.

In a similar analysis, Dickey et al. (2001) have measured the spatial power spectrum of neutral hydrogen in two regions of the fourth Galactic quadrant. They found that the HI data of the warm gas in their survey shows a systematic increase of the index for velocity widths of upto 15 km/s, also when averaging over all velocity bins. However, the cold gas at much lower latitudes behaves differently and shows rather constant indices of 2.7-3.1. Similarly, our CO data shows no significant variation of the index when averaged over all velocity bins. The indices rather stay constant at $\sim 2.8 \pm 0.4$.

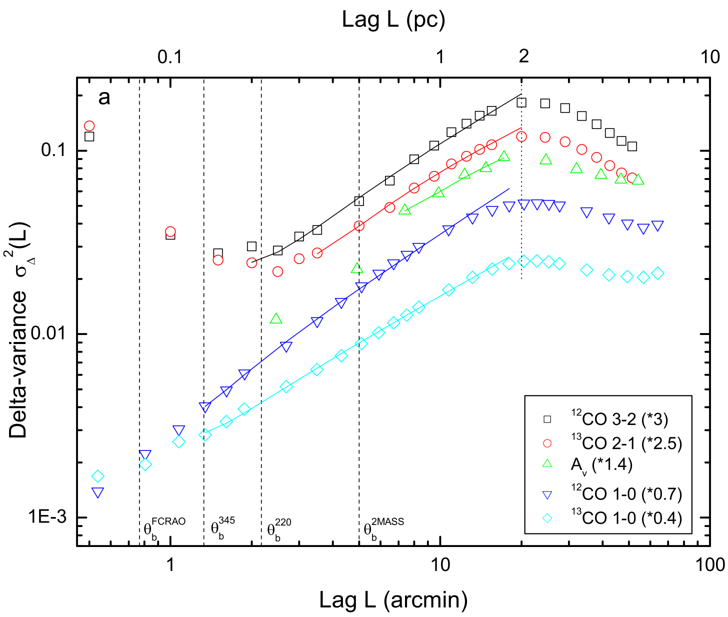

Fig P 34. Δ-variance analysis of the integrated intensity maps of the KOSMA CO data and other data from the COMPLETE team (Goodman 2004). The Δ-Variance spectra have been scaled by the listed factors for clarity.

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Evidence for Turbulence in the Velocity Fields of Perseus Cores

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The idea that turbulence is critical to the star formation process has been invigorated by the increasing resolution of millimeter/submillimeter interferometric observations and the increasing sophistication of numerical models. In a turbulent formation scenario (Mac Low & Klessen 2004), the distribution of stellar masses and the range of star formation rates are consequences of the competition between gravity and turbulence in molecular clouds. Dense cores are dynamic objects created at the collision interfaces of turbulent flows. Protostars form at the scale where turbulent support dissipates, and their properties (number, masses, multiplicity) are determined by the physical conditions (density, temperature, velocity field) of the gas from which they emerge. Observations seeking to determine the scale where turbulence dissipates (*e.g.* Goodman *et al.* 1998, Caselli *et al.* 2002) are inconclusive.

We present an investigation of the velocity fields of dense cores in the Perseus cloud. Our analyses of the variations in the emission line properties (central velocities and line widths) across the cores shows that turbulence persists on scales significantly smaller than the typical core radius (0.1 pc). Our observations are taken from the survey of Perseus cores made with the BIMA interferometer and the FCRAO 14 m telescope in the $\lambda = 2.7$ mm continuum (Looney, Mundy, & Welch 2000) and the $C^{18}O$, $H^{13}CO^+$, and N_2H^+ 1-0 lines (Volgenau 2004). The maps probe a range of spatial scales, from $\sim 50''$ down to $3''$; the latter resolution corresponds to ~ 1000 AU at the distance of Perseus.

We analyze the core velocity fields by measuring the emission lines from successively smaller grid squares. We find that the dispersion in line widths increases for lines measured from smaller grid squares (a result that is consistent with models of turbulent clouds, *cf.* Ostriker, Stone, and Gammie 2001). The minimum line widths are generally consistent with sonic turbulence (the H_2 sound speed) rather than thermal broadening of the emitting molecule. In addition, the variations in the line properties (*i.e.* differences in central velocities, ΔV_C, and line widths, $\Delta\sigma_V$, as a function of spatial separation) provide two lines of evidence for turbulence on sub-core scales. First, the power law relation between the variances of ΔV_C and $\Delta\sigma_V$ and the separation interval is a signature of hierarchical turbulence (Miesch & Bally 1994). Second, cores with more active velocity fields have greater ΔV_C and $\Delta\sigma_V$ variances at all separations.

Dust-driven Winds and Their Resulting Mass Loss at Subsolar Metallicity

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Intermediate mass stars contribute to the enrichment of the interstellar medium via mass-loss of the order of up to several $10^{-5} M_\odot\,\mathrm{yr}^{-1}$ during their evolution along the Asymptotic Giant Branch. As driving mechanism radiation pressure on dust grains formed in the cool atmospheres of these stars plays an important role. The stellar pulsation results in a levitation of the atmosphere, pushing the atmospheric gas into the dust formation window, a thermodynamic regime where density and temperature are favourable for grain formation. Radiation pressure then accelerates the dust particles and the surrounding gas is dragged along via frictional coupling, generating those massive outflows.

In our work, we are interested in the total mass lost, as a function of time, by stellar samples with subsolar metallicities. In order to give a quantitative account, a description of the mass loss is needed which can be applied to stellar evolution calculations. Following the approach for solar metallicity stars we derive the mass-loss description from hydrodynamical wind models for long-period variables. The models have been adapted to the lower opacity, which is to be expected because of the low metallicity. This modification involves a proper description of the transport of radiation through a medium of arbitrary optical thickness.

In this contribution we present results obtained from models calculated with abundances as found in the Large and the Small Magellanic Cloud, respectively. The mass-loss history of single stars is examined as well as their integrated mass loss.

Two adjacent gigantic ($\sim 9°$) IRAS filaments of bipolar morphology: An almost invisible pair

P 37

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In a recent paper, Weinberger & Armsdorfer (2004) reported on two huge - lengths of $\sim 9°$ each - adjacent bipolar filaments discovered by them on 60 μm and 100 μm IRAS maps at high Galactic latitude. These objects do not show counterparts at other wavelengths (using *SkyView*). Even on deep optical images (2m Tautenburg Schmidt; Hα, [SII]) they are not visible. The filaments are extremely collimated (length-to-width ratios 20–50), are curved, knotty, and end in prominent bubble-like lobes. Their dust temperatures are 25 $\pm$ 3 K and 30 $\pm$ 4 K, respectively. One of the objects appears to harbor a faint very red star of high proper motion (0.23" per year) in its very centre, suggesting a distance of $\sim$60 pc. At this distance, the combined mass of both objects (assuming a gas-to-dust ratio of 200) totals 1 $M_\odot$. We suspect that these gigantic structures ($\sim$ 9 pc each, if in the sky plane) could be fossil jets and have a common origin, due to the decay of a system of evolved stars. For images see astro.uibk.ac.at/dustjets/.

In order to find conclusive arguments for these objects for not being chance superpositions of (unrelated) dust emission features, kinematic data are indispensable - the more, since we wish to provide evidence for their nature as (fossil) jets. Furthermore, data at other wavelengths than the far IR could also help to get insight into the physical processes in these objects. To this end, in April 2005 I used the IRAM 30m telescope with the aim to reveal their basic kinematics in 12CO(2-1). The multipixel receiver HERA was used, and - after I was not able to locate any obvious emission within the 1 GHz bandwidth – VESPA (80, 80) was selected as backend; frequency switching was employed. With the latter configuration, observations were carried out at 9 positions along the southern jet candidate (Object A) and at 1 position somewhat outside this object. In the case of the northern candidate (Object B) 10 positions along its entire length were chosen. A preliminary data reduction did not show any clear sign of the CO emission line.

For mid June 2005 M. Thompson and I had planned to carry out SCUBA observations at the 15m JCMT of some knots in Object B to i) determine their morphologies, ii) measure their mass, temperature and densities, iii) investigate the nature of dust within the knots, and iv) compare the knot mass with position along the possible jet to infer the mass injection history. However, SCUBA became out of order shortly before our observing run and we instead decided to undertake further attempts to find the 12CO(2-1) line in the jet candidates. Particularly, the centre of Object A and the brightest knot (which has about 10 Jy at 100 micron) of Object B were observed - the latter with an integration time of 30 minutes. However, no line was found. - The lack of measurable CO emission indicates that the objects are indeed of very low mass; CO could be underabundant. This preliminary result means that any molecules there are not (easily) measurable with the presently available sensitivity. HI observations might be the only means to get radial velocities of these objects, and SCUBA2 seems to be a promising future possibility to map both objects in their entirety.

I greatly appreciate the invaluable help of Mark Thompson prior to and during the observations at the JCMT. Thanks are due to Arancha Castro-Carrizo for her extensive advice prior to my observations at IRAM. Further I thank Jens Woitas for providing deep Hα and [SII] images. I am grateful for the award of observing time at the IRAM 30m telescope and at the JCMT and for the support of the staff at both observatories. This work has benefited from research funding from the European Community's Sixth Framework Programme (RadioNet TNA support). Part of this work was supported by the Austrian Science Funds (FWF), project no. P15316.

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A new optical filament of the Monogem Ring

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The Monogem Ring supernova remnant covers a huge region with the diameter of ∼25° and is easily visible in soft X-ray images. The pulsar PSR B0656+14 is associated with this remnant (Thorsett et al. 2003). Recent findings indicate that the ∼300 pc distant Monogem Ring and partly also PSR B0656+14 may be responsible for the sharp knee in the cosmic ray energy spectrum at ∼3 PeV (Erlykin & Wolfendale 2004). This SNR thus is an object of high astrophysical importance. – The Monogem Ring is further reported to be unusual among the Galactic SNRs in that it appears to be visible almost exclusively at soft X-rays. For example, no optical emission is expected from this object, which seems to be in the adiabatic expansion phase: as it continues to evolve, it will most likely reach pressure equilibrium with the ISM before it reaches the radiative stage of SNR evolution, since it is located in a region of the Galaxy with unusually low density (Plucinsky et al. 1996).

However, the Monogem Ring probably does show some optical emission, at least in a small part of its S-E borders, as we are now able to demonstrate. In the course of systematic searches for galaxies (Seeberger et al. 1996), we had noticed, on POSSII R, an extremely faint arc of nebulosity located at about ℓ = 212.5°, b = +10.6°. Spectra taken with the 1.8m tel. of the Asiago Observatory show faint emission lines of [NII], Hα, and [SII]. The [SII]/Hα ratio is, with up to 1.74, characteristic of shock excitation, and the [SII]671.6/[SII]673.1 ratio of up to 1.66 indicates very low electron density. – This nebula, whose position is given in Fig. P 38, became very well visible on direct images in Hα and in [SII] taken with the 2m Tautenburg Schmidt tel.; it appears as a remarkably thin and structured ∼20′ long filament located in N-S direction, showing a wide bifurcation at its northern end.

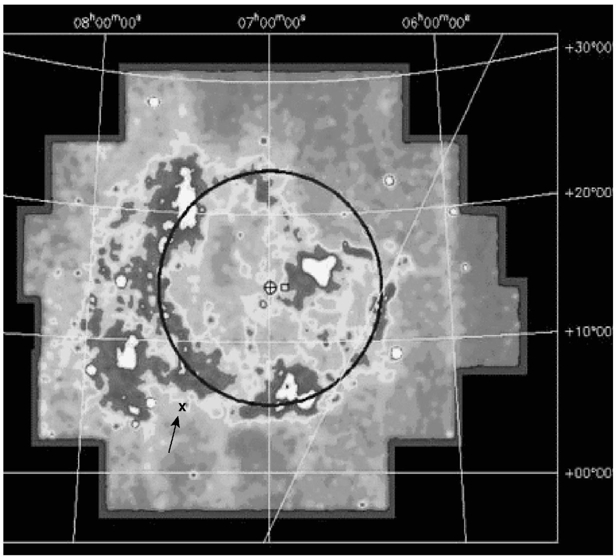

Fig. P 38. The Monogem Ring supernova remnant, as seen in the ROSAT all-sky survey in the 0.25–0.75 keV X-ray band. The pulsar PSR B0656+14 is marked with cross-hairs, and the ∼9° circle shows the primary ring structure. The image is taken from Thorsett et al. (2003). The cross in the south-east, highlighted by an arrow, shows the position of the new, ∼20′ long faint optical filament detected by us.

We gratefully acknowledge helpful discussions with Binil Aryal. This work was supported by the Austrian Science Funds (FWF), project no. P15316.

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The *Far Ultraviolet Spectroscopic Explorer* Survey of O VI Emission in the Milky Way

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We present a survey of O VI λ1032 emission in the Milky Way using data from the *Far Ultraviolet Spectroscopic Explorer (FUSE)* satellite. Our survey contains 112 sight lines, 23 of which show measurable O VI λ1032 emission.

The O VI resonance doublet at 1031.93 and 1037.62 Å provides the primary cooling mechanism for collisionally-ionized gas at temperatures $\sim 3 \times 10^5$ K (Sutherland & Dopita 1993, ApJS, 88, 253). Except for an O VI absorption survey toward nearby stars conducted with the *Copernicus* satellite (Jenkins 1978, ApJ, 219, 845; Jenkins 1978, ApJ, 220, 107), large surveys of O VI in the Galactic disk and halo have had to await the launch of *FUSE* in 1999. Several O VI absorption-line surveys have now been executed with *FUSE* (e.g., Wakker et al. 2003, ApJS, 146, 1; Savage et al. 2003, ApJS, 146, 125).

The combination of emission and absorption-line observations enables us to derive the local density of the emitting gas and provides a powerful diagnostic with regard to the cooling mechanism in the emitting region. O VI emission has been observed with *FUSE* along a handful of sight lines, but more observations are required to investigate the distribution, kinematics, and emission mechanisms of O VI-bearing gas in the Galaxy. With the 23 new O VI detections of our survey probing diffuse, hot gas, this investigation can now begin.

The O VI λ1032 emission feature was detected at all latitudes and exhibits intensities of 2000–11,000 photons s^{-1} cm^{-2} sr^{-1}. About half of our detection sight lines sample clouds whose velocities are consistent with a corotating halo. Two sample calculations combining adjacent emission and absorption measurements yield an emitting layer with an O VI density of 6.4×10^{-6} cm^{-3}, an electron density $n_\mathrm{e} = 0.12\,\mathrm{cm}^{-3}$, and a path length through the gas of ~ 1.3 pc for one pair of mid-latitude sight lines, while another emission-absorption line pair yields a thickness of 150 pc and an electron density of $n_\mathrm{e} = 0.013\,\mathrm{cm}^{-3}$. These calculations only indicate the variety that lies in the physical properties of the diffuse gas. Sight lines probing the Galactic halo exhibit lower O VI and Hα emission with little or no structure in the Hα emission. The remaining sight lines show no correlation between O VI emission and Hα intensity or morphology. The *FUSE* detection limit of ~ 2000 photons s^{-1} cm^{-2} sr^{-1} is higher than the expected O VI emission from high-velocity clouds. Therefore, none of the sight lines toward high-velocity clouds shows measurable O VI emission. The observed O VI intensities are anti-correlated with the soft X-ray background, as would be expected for gas cooling from 10^6 K. The observed variation in O VI intensities with Galactic latitude is consistent with the picture derived from the recent O VI absorption surveys: low-latitude sight lines exhibit emission mostly from interfaces and mixing layers between hot and cold plasma in the thin disk, while high-latitude sight lines probe O VI emitting gas in the clumpy, thick disk of the Galaxy.

OSIRIS First Light: Observations of the Galactic Center

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OSIRIS (OH Suppressing IR Imaging Spectrograph) is a diffraction limited infrared integral field spectrograph designed for the 10 m Keck II (Hawaii) Adaptive Optics (AO) System. It utilizes an array of micolenses and the latest infrared detector to simultaneously obtain more than 3000 spectra over a rectangular field of view (up to 48x64 spatial elements). In its broad band mode (16x64 spectra), each spectrum contains more than 1700 wavelength channels and covers an entire infrared band at a resolution of 3700. Due to the extremely low backgrounds between night sky lines and at AO spatial samplings, the instrument is also extremely sensitive. First light was achieved on February 22, 2005. Here we present first results from the ongoing commissioning observations, dedicated to a variety of astrophysically interesting targets. An example of the superb quality of the instrument is shown in the figure, representing one of several 5 min K-band exposures at the location of SgrA* (arrow), obtained on April 29 2005. SgrA* as well as the stars within the field have been well studied by the groups of Eckart (Cologne), Genzel (Garching) and Ghez (UCLA) and are found to be rapidly orbiting a supermassive blackhole which lies at the very center of the Galaxy. During our short exposures we appear to have captured the black hole while it is flaring in brightness; presumably as some material finds itself torn apart on its ultimate spiral across the Schwarzschild radius.

Flares of SgrA* have been initially reported by Genzel et al. (2003), Ghez et al. (2004), and Eckart et al. (2004). Flare spectra in the K-band have been observed for the first time by Eisenhauer et al. 2004. They report a spectral index of the flare spectrum of the order of ν^{-3} in the K-band. A preliminary investigation of the spectral index of our flare spectrum indicates a rather low value, slightly redder than S2, which, if persistent, would be more consistent with the lower values reported by Ghez et al. (2003) based on L-band data. It might also be possible that the spectral indices of flare spectra vary during each flare. Such a variability would require close monitoring to extract the underlying processes.

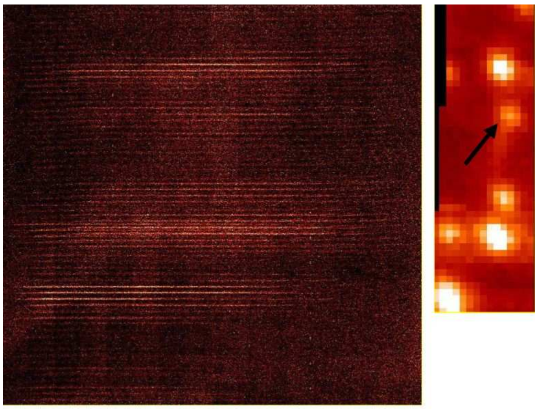

Figure: In this 5 minute K-band exposure we explore the central fraction of an arcsecond within our Galaxy at the location of SgrA* (arrow). The image format is about $0.3'' \times 0.9''$, each pixel is 20 mas wide. The laser assisted AO angular resolution is about 55 mas. The panel on the left shows the raw OSIRIS spectrum that produced the image on the right. A carefull examination will identify all of the objects in the raw data.

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Jets on the Sun

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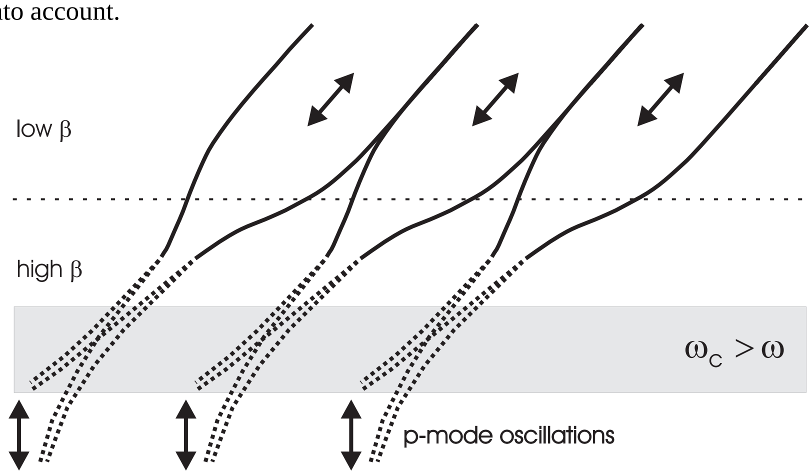
The Sun is constantly ejecting numerous plasma jets, visible as needle-shaped spicules at the solar limb, or on the solar disk as mottles in magnetically quiet regions and as fibrils in active regions. Spicule plasma shoots up at supersonic speeds of 20–30 km s^{-1}, reaching heights of 5–10 Mm within a few minutes. The mass flux involved exceeds the solar wind mass loss from the corona by two orders of magnitude, so almost all of the plasma falls ultimately back.

All of these jets appear to be confined by magnetic field. The ultimate driving mechanisms have not yet been identified, although dozens have been suggested, including granular buffeting of magnetic flux tubes, magnetic reconnection, or various kinds of instabilities (for references see, e.g., Sterling 2000 or Hammer & Nesis 2005). It is unlikely that a single mechanism is responsible for all of these jets (Hammer & Nesis 2005).

Recently De Pontieu, Erdélyi & James (2004) suggested a very interesting mechanism for driving the flows in active region filbrils, based on the interaction of solar oscillations with inclined magnetic flux tubes. This mechanism is explained in the figure and its caption, where we also show that it needs to be expanded by taking transverse tube waves into account.



Magnetic flux tubes are rooted in the photosphere, which is essentially free of magnetic field (i.e., plasma β, the ratio of gas to magnetic pressure, is large). Due to the stratification of the atmosphere, the flux tubes expand with height and fill all available space in the overlying chromosphere, where thus plasma β becomes smaller than 1. In the photosphere, the mostly vertical solar p-mode oscillations inject energy into the flux tubes – partially as longitudinal, but in inclined flux tubes also as transverse motions. *Longitudinal* waves can only traverse the cool temperature minimum region if the flux tubes are sufficiently inclined, so that the cut-off frequency $\omega_c \propto \gamma g/c = \gamma g_0 \cos\theta/c$ does not become too large (where θ is the inclination angle to the vertical, γ the ratio of specific heats, and c the sound speed). De Pontieu et al. (2004) showed that this transmitted portion of the longitudinal waves can drive jet-like phenomena in the upper atmosphere. *Transverse* tube waves, however, have much milder cut-off restrictions and are thus barely hindered on their way into the chromosphere, where they are converted to longitudinal waves by mode-coupling, in particular in the region where $\beta \approx 1$ (dashed line), but also elsewhere through inclination and nonlinearity effects. Therefore we suggest that transverse waves contribute significantly to the leakage of p-mode signals into the upper parts of inclined flux tubes. Moreover, we note that even for longitudinal waves an enhanced temperature (and thus ionization ratio) within flux tubes would further increase that leakage through the dependence of ω_c on γ and c.

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Observations of Solar Magnetoconvection

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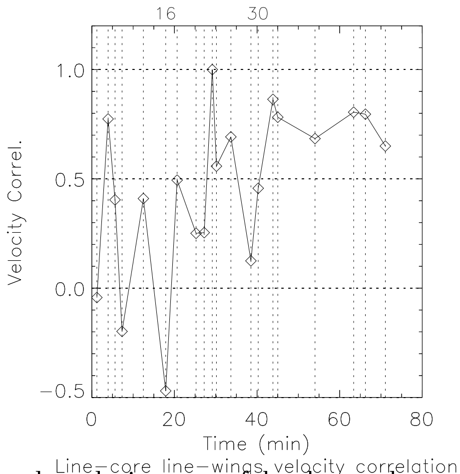
Introduction. Abnormal granulation is characterized by the reduction of its granular contrast and geometric scales, which according to Dunn and Zirker (1973) has to be attributed to the magnetic field located in the vicinity of this region. Thus, observations of an abnormal granulation area over time are an efficient way of studying the behavior of convection in the presence of magnetic field. In a previous paper (Nesis, Hammer and Schleicher 2004) we investigated the formation and decay of intensity structures of an abnormal granulation area located in the vicinity of magnetic pores. In the current work we proceed with the investigation of the same abnormal granulation area by studying its dynamical behavior over time and space.

Material. The current investigation is based on a series of 2D spectroscopic observations taken in June 2003 with TESOS (Triple Etalon SOlar Spectrometer, Tritschler et al. 2002) in connection with the adaptive optics system KAOS (Kiepenheuer Adaptive Optics System, Soltau et al. 2002) at the German Vacuum Tower Telescope (VTT) at the Observatorio del Teide (Tenerife). The spectral lines observed were Ni I 491.2 nm and Fe I 557.6 nm, both with $g_{\rm eff} = 0$, and Cr 578.1 nm with $g_{\rm eff} = 1.8$. The exposures were taken with a Xedar 2048 x 2048 camera. In the present work we concentrate on the reduction and analysis of the data from the white light channel and Doppler velocities from the Fe I 557.6 nm channel of TESOS.

Results and Discussion. The reduction of the granular contrast and geometric scales of the abnormal granulation as compared to the undisturbed granulation infers a partial interruption of the convective transport, i.e. the distortion of the convective flow with height in the photospheric layers. To study the coherence of this flow with time and height in the photosphere we correlated the Doppler velocity field of higher and deeper photospheric layers (velocity measured at line core and line wings). The figure shows the time variation of the correlation, which actually reflects the partial loss of the similarity between the velocity fields and can be interpreted as a manifestation of the interruption of flow coherence between the deeper and higher photospheric layers. Of particular interest is that in the first half of the observing time the correlation value is less than 0.5, compared to approximately 0.7 in the second half. In the first half the granular intensity structuring weakened, while it recovered in the second half. Important is also (i) the transition of the correlation from 0.5 to 0.9 within ca. 4 min, and (ii) the fact that two pores changed their topology and became smaller with time.



Time variation of the correlation of the Doppler velocity maps of the abnormal area measured at two different photospheric heights.

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Tritschler, A., Schmidt, W., Langhans, K., & Kentischer, T., 2002, Sol. Phys. 211, 17