

## I. A selection of five refereed publications

In the following, a selection of five refereed publications is presented, along with a rationale for their selection. Links for online access are indicated.

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### **1. First evidence of quasi-periodic magnetic intraday activity from SiO emission in the atmosphere of two Mira stars**

Wiesemeyer, H.W., Thum, C., Baudry, A. & Herpin, F., 2009, *Astron. Astrophys.* 498, 801

After years of development and commissioning of correlation spectropolarimetry at mm wavelengths (Thum et al., 2008), we recently discovered intraday variations of the circular polarization of SiO masers in two Mira stars. This may turn out be the first detection of extrasolar planetary magnetism. While alternative models (binaries, stellar magnetic flux loops extending to the SiO maser zone, magnetic clouds traversing the extended atmosphere of the star, Parker instabilities) cannot explain all features of our detections, namely local magnetic fluctuations on a timescale of hours, precessing magnetospheres of Jovian planets predict all findings without difficulties. The case of R Leo, one of the best studied Mira stars, received an independent support from VLBA maps (Cotton et al., 2008) with a signature, at the velocity where we detect the fluctuations, reminiscent of a planetary wake flow (Struck et al., 2004). Orbital evolution is decisive for the survival of the planet not only when its parent star is on the upper asymptotic giant branch (the planet may be dragged inwards and evaporate in the star, or its orbit be repelled) but also in the subsequent planetary nebula stage, where planets survive evaporation by the hot central star only under certain conditions (Villaver & Livio, 2007) set during the AGB phase. Planetary magnetic fields (our data require a few Jovian magnetic dipole moments) may tip the scales, via tidal friction. Dedicated radiative transfer models (Wiesemeyer, 2009, *A&A* 501, 647) accompany this work.

<http://cdsads.u-strasbg.fr/abs/2009A%26A...498..801W>

<http://cdsads.u-strasbg.fr/abs/2009A%26A...501..647W>

### **2. Large excess of heavy Nitrogen in both HCN and CN from Comet 17P/Holmes**

Bockelée-Morvan, D.; Biver, N.; Jehin, E.; Cochran, A. L.; Wiesemeyer, H.; Manfroid, J.; Hutsemékers, D.; Arpigny, C.; Boissier, J.; Cochran, W.; and 8 coauthors 2008, *ApJ* 67, L49

For more than ten years, submm spectra from Hale-Bopp (Jewitt et al., 1997, Ziurys et al., 1999) suggested that the enrichment of this Oort cloud comet in heavy Nitrogen ( $^{15}\text{N}$ ) is similar to the terrestrial value in  $\text{C}^{14}\text{N}/\text{C}^{15}\text{N} = 272$ , a conclusion since then often cited in literature. However, we show (1) that a careful re-analysis – accounting for telescope, receiver and backend specifications – of the public data rather suggest  $^{14}\text{N}/^{15}\text{N} = 152$ , which corresponds to the values we derive from HCN and CN in the transneptunian scattered-disk comet 17P/Holmes ( $139 \pm 26$  respectively  $165 \pm 30$ ). Unlike the erroneous analysis of Hale-Bopp data that yielded different enrichment of heavy N in HCN and CN, our results (both from our 30m observations of 17P/Holmes and from the re-analysis of the Hale-Bopp data) confirm that HCN is the prime parent of CN (a photolysis product) in cometary atmospheres, and that the excessive heavy Nitrogen enrichment (with respect to the Earth's atmosphere) occurred before the inclusion into the cometary material during solar system formation, via important isotopic fractionation of Nitrogen bearing volatiles that composed the icy phase of the outer solar nebula. Suggestions for the excess reach from conversion of molecular into atomic Nitrogen via nucleosynthesis to photochemical self-shielding in the solar nebula and are strengthened by our results.

<http://cdsads.u-strasbg.fr/abs/2008ApJ...679L..49B>

### **3. The polarization of mm methanol masers**

Wiesemeyer, H., Thum, C. & Walmsley, C..M., 2004, *Astronomy & Astrophysics* 428, 479

Substantial linear polarizations ( $> 10\%$ ) have been measured for mm-wavelength methanol masers in 12 Galactic high-mass star forming regions. For NGC7538, the polarization angles of both the Class I masers (residing in the outflow and pumped by collisions) and the Class II masers (associated with the ultracompact HII region and radiatively pumped) coincide remarkably well with those of the submillimeter dust continuum emission. Since the maser polarization is either parallel or perpendicular to the direction of the magnetic field projected onto the plane of the sky, this coincidence supplies evidence for the magnetic alignment of dust grains, and justifies the selection of this paper. In OMC2, the polarization vector of the prominent Class I maser is close to the outflow axis. The maser is suggested to originate in a lateral C-type shock. All Class II masers have at least two polarized velocity components with the same polarization characteristics. This indicates velocity redistribution along the propagation direction of a single maser with a velocity gradient. Two masers are significantly circularly polarized, a surprise given the weakness of the Zeeman splitting. We propose a misalignment between the quantization axis and the plane of linear polarization, most likely due to a change of the magnetic field direction along the maser propagation path. This work has been cited several times at the IAU Symposium 242 "Astrophysical Masers and their Environments".

<http://cdsads.u-strasbg.fr/abs/2004A&A...428..479W>

### **4. Structure and chemical composition of silicate dust around OH/IR stars**

Demyk, K., Dartois, E., Wiesemeyer, H., Jones, A.P. & d'Hendecourt, L., 2000, *A&A* 364, 170

This study of the dust shells of two OH/IR stars, observed with the SWS spectrometer aboard the Infrared Space Observatory, provided a quantitative analysis of the composition of the dust. The appearance of crystalline Forsterite ( $Mg_2SiO_4$ ) and water ice both in emission and absorption necessitated a radiative transfer model, using dust models both from literature and laboratory spectra. The derived chemical compositions are entirely compatible with simple condensations models at thermodynamic equilibrium. Among the citations of this publication is a work by Maldoni et al. (2005) who used our radiative transfer modelling of the mid-infrared dust features as a benchmark.

<http://cdsads.u-strasbg.fr/abs/2000A&A...364..170D>

### **5. High resolution studies of protostellar condensations in NGC 2024**

Wiesemeyer, H., Güsten, R., Wink, J.E. & Yorke, H.W., 1997, *Astron. & Astrophys.* 320, 287

Although published ten years ago, this publication has recently been used as a reference by Mac Low & Klessen (2004) for the discovery of an hierarchy of interstellar clumps and filaments down to the scale of individual protostars. The environment of the HII region NGC2024 is a part of the Orion B molecular cloud, the nearest site of Galactic high mass star formation. Its far-infrared condensations have been deemed isothermal protostellar envelopes, owing to the freeze-out of tracer molecules (and their reactants) onto the surface of cold cosmic dust grains. We have shown, using a continuum radiative transfer model, that the freeze-out does not contradict the presence of a hot protostellar core of a few 100 K, simply because the dust, optically thick at submm wavelengths, is an efficient cooling agent. We showed that without high-resolution submm data, it is impossible to distinguish between a massive, low-luminosity envelope, and a less massive one of higher temperature. This conclusion has been subsequently confirmed by an independent study (Visser et al., 1998). Despite the heated debates that the initial detection of these high-mass protostars caused in the 1990s, our results have not been disputed since then, while follow-up observations of higher spatial resolution are needed to clarify the very nature of the far-infrared condensations.

<http://cdsads.u-strasbg.fr/abs/1997A&A...320..287W>

## II. Refereed publications, including recent submissions

1. Wiesemeyer, H. *The modulation of SiO maser polarization by Jovian planets.* *Astron.Astrophys.* **501**, 647 (2009).
2. Yusef-Zadeh, F, et al. *Simultaneous Multi-Wavelength Observations of SgrA\* during 2007 April 1-11.* Submitted to *ApJ* (2009).
3. Wiesemeyer, H., Thum, C., Baudry, A., Herpin, F. *Precessing planetary magnetospheres in SiO stars ? First evidence of quasi-periodic polarization fluctuations in R Leo and V Cam.* *Astron.Astrophys.* **498**, 801 (2009).
4. Forbrich, J., Wiesemeyer, H.W., Thum, C., Belloche, A., Menten, K. *Observations of the Goldreich-Kylafis effect in star-forming regions with XPOL at the IRAM 30m telescope.* *Astron.Astrophys.* **492**, 757 (2008).
5. Raiteri, C.M., et al. *A new activity phase of the blazar 3C 454.3 – Multifrequency observations by the WEBT and XMM-Newton in 2007-2008 (Astron.Astrophys, in press).* *Astron. Astrophys.* **491**, 755 (2008).
6. Eckart, A., et al. *Simultaneous NIR/submm observation of flare emission from SgrA\*.* *Astron. Astrophys.* **492**, 337 (2008).  
See also: Eckart, A., et al. *Probing Sagittarius A\* and its Environment at the Galactic Centre: VLT and APEX Working in Synergy.* *The Messenger* **133**, 26 (2008).
7. Kunneriath, D., Eckart, A., Vogel, S., Sjouwerman, L., Wiesemeyer, H., et al. *Coordinated mm/sub-mm observations of Sagittarius A\* in May 2007.* *Journal Phys. Conf. Ser.* **131**, 012006 (2008).
8. Eckart, A. et al., *Coordinated multi-wavelength observations of Sgr A\*.* *Journal Phys. Conf. Ser.* **131**, 012002 (2008).
9. Leroy, A.K. et al. *HERACLES: The HERA CO-Line Extragalactic Survey.* *Astronomical Journal* **137**, 4670 (2009).
10. Raiteri, C.M., et al. *The high activity of 3C44.3 in autumn 2007. Monitoring by the WEBT during the AGILE detection.* *Astron. Astrophys.* **485**, L17 (2008).
11. Thum, C., Wiesemeyer, H., Paubert, G., Navarro, S., Morris, D. *XPOL – the correlation polarimeter at the IRAM 30m telescope.* *Publ. Astron. Soc. P.* **120**, 777 (2008).
12. Bockelée-Morvan, D., Biver, N., Jehin, E., Cochran, A.L., Wiesemeyer, H. et al. *Large Excess of Heavy Nitrogen in both HCN and CN from Comet 17P/Holmes.* *Astrophys. J.* **679**, L49 (2008).
13. Herpin, F., Baudry, A., Thum, C., Morris, D., Wiesemeyer, H. *Full polarization study of SiO masers at 86 GHz.* *Astron. Astrophys.* **450**, 667 (2006).
14. Wiesemeyer, H., Thum, C., Walmsley, C.M. *The polarization of mm methanol masers.* *Astron. Astrophys.* **428**, 479 (2004).

15. Schuster, K.F., et al. *A 230 GHz heterodyne receiver array for the IRAM 30m telescope*. *Astron. Astrophys* **423**, 1171 (2004).
16. Paunzen, E., Kamp, I., Weiss, W.W., Wiesemeyer, H. *A study of  $\lambda$  Bootis type stars in the wavelength region beyond 7000 Å*. *Astron. Astrophys.* **404**, 579 (2003).
17. van Zadelhoff, G.-J., et al. *Numerical methods for non-LTE line radiative transfer*. *Astron. Astrophys.* **395**, 373 (2002).
18. Hofner, P., Wiesemeyer, H., Henning, T. *A high velocity molecular outflow from the star forming region G9.62+0.19*. *Astrophys. J.* **549**, 425 (2001).
19. Demyk, K., Dartois, E., Wiesemeyer, H., Jones, A.P., d'Hendecourt, L. *Structure and chemical composition of the silicate dust around OH/IR stars*. *Astron. Astrophys.* **364**, 170 (2000).
20. Altenhoff, W.J., et al. *Coordinated radio continuum observations of comets Hyakutake and Hale-Bopp*. *Astron. Astrophys.* **348**, 1020 (1999).
21. Wiesemeyer, H., Güsten, R., Wink, J.E., Yorke, H.W. *High resolution studies of protostellar condensations in NGC2024*. *Astron. Astrophys.* **320**, 287 (1997).
22. Wiesemeyer, H., Güsten, R., Wink, J.E., Yorke, H.W. *High resolution studies of protostellar condensations in NGC2024*. *Lecture Notes in Physics* **465**, 468 (1996).
23. Uchida, K.I., Wiesemeyer, H., Güsten, R. *High-resolution  $C^{34}S$  images of the W51 region taken with the Plateau de Bure interferometer*. *Lecture Notes in Physics* **459**, 285 (1995).

### III. A selection of non-refereed publications and list of other presentations

#### Conference talks and posters (selection of the most important contributions):

- Wiesemeyer, H., Thum, C., Walmsley, C.M. & Paubert, G. *A polarization survey of mm methanol masers*, in: "Astronomical Polarimetry: Current Status and Future Directions" (eds. A. Adamson et al.), *Astron. Soc. Pac. Conf. Ser.* **343**, 160 (2005, oral presentation H.W.).
- Thum, C., Wiesemeyer, H., Morris, D., Navarro, S. & Torres, M. *Versatile IF polarimeter at the IRAM 30m telescope*, in: "Polarimetry in Astronomy" (ed. Silvano Fineschi), *Proceedings of the SPIE* **4843**, 272 (2003, oral presentation C.T.).
- Wiesemeyer, H. *Digital Cross Correlators*, in "Proceedings of the 2<sup>nd</sup> Millimeter Interferometry Summer School" (ed. A. Dutrey, ISBN 2-9516869), p. 71, also at [http://www.iram.fr/IRAMFR/IS/IS2002/html\\_2/node43.html](http://www.iram.fr/IRAMFR/IS/IS2002/html_2/node43.html)
- Wiesemeyer, H., Cox, P., Güsten, R., & Zylka, R. *ISOCAM observations of extremely young Class 0 candidates*, in: "The Universe as Seen by ISO" (eds. P.Cox & M.F. Kessler), *ESA-SP* **427**, 533 (1999, poster presentation H.W.).

Wiesemeyer, H., Güsten, R., Cox, P., Zylka, R. *The Pivotal Onset of Protostellar Collapse: ISO's View and Complementary Observations*, in: "Star Formation with the Infrared Space Observatory" (eds. J. Yun & R. Liseau), Astron. Soc. Pac. Conf. Ser. **132**, 189 (1997, oral presentation H.W.)

Wiesemeyer, H., Güsten, R. & Wright, M.C.H. *The spectral signature of accretion in low-mass protostars: observations and NLTE modelling*, in: "Low Mass Star Formation - from Infall to Outflow" (eds. F. Malbet & A. Castets), IAU Symposium **182** on "Herbig Haro Objects and the Birth of Low-Mass Stars", p. 260 (1997, poster presentation H.W.)

Wiesemeyer, H., Güsten, R., Zylka, R., Fiebig, D. & Wright, M.C.H. *Low Mass Star Formation in Globular Filaments: Evidence from Dust and Molecular Line Emission*, in: "The Role of Dust in the Formation of Stars." (eds. H.U. Käufel & R. Siebenmorgen). ESO Astrophysics Symposia/ Springer (Berlin), p. 440 (1996, oral presentation H.W.)

### **Selection of other oral presentations (invited or contributed, colloquia, seminars, workshops, evaluation committees):**

Astronomical Institute, University of Vienna & Laboratoire d'Astrophysique, Bordeaux ([Polarimetry from Radio to Far-Infrared Wavelengths](#), 2008)

Astrophysics Group, Cavendish Laboratory, Cambridge (UK) (High-mass star formation, YERAC 1994)

Astrophysikalisches Institut der Universität Jena (Spectral signatures of protostellar collapse, colloquium, 1997)

Deutsche Physikalische Gesellschaft, Bad Honnef (non-LTE radiative transfer in low-mass star formation, DFG Schwerpunktprogramm "Star formation", annual colloquium, 1996)

Ecole de Physique des Houches (Université Joseph Fourier & INPG Grenoble) (High-mass star formation, YERAC 1993)

Harvard-Smithsonian Center for Astrophysics, Cambridge, Mass. (Star formation and NLTE radiative transfer in globular filaments, colloquium, 1998)

Institut de Radioastronomie Millimétrique, Grenoble (various user meetings and seminars)

Institut für theoretische Astrophysik, Heidelberg (NLTE radiative transfer in Class 0 protostars, colloquium, 1995)

Institut für theoretische Physik und Astrophysik, Universität Würzburg (High-resolution interferometry of high-mass star forming regions, colloquium, 1994)

Jet Propulsion Laboratory, Pasadena (Follow-up meeting to Protostars & Planets IV, Radiative transfer in protoplanetary disks, 1998)

Laboratoire d'Astrophysique de l'Observatoire de Grenoble (The spectral signatures of accretion in low-mass protostars, seminar, 1997)

Lorentz Center/Sterrewacht, University of Leiden (Radiative transfer workshop, 1999)

Max-Planck Institut für Radioastronomie, Bonn (Star formation in Globular Filaments, evaluation committee, 1997, & Molecular line formation in protoplanetary disks, colloquium, 2000)

Oxford e-Science Centre (Facets of Instrumental Polarization – Lessons learned from Single Dish Correlation Polarimetry, workshop on “Imaging and Calibration Algorithms for EVLA, e-MERLIN and ALMA”, 2008)

Radio Astronomy Laboratory, University of California at Berkeley (Modelling Line Formation in Protostellar Collapse, colloquium, 1996)

Ringberg Castle, MPG conference center (Star Formation in Globular Filaments, workshop on star formation, 1996, & NLTE radiative transfer in protoplanetary disks, workshop on star formation, 1999)

Steinmann-Institut für Geologie, Mineralogie und Paläontologie der Universität Bonn  
Physikalisches Institut der Universität zu Köln (Signatures of dust metamorphosis in star formation, colloquium, 1997)

### **Selected Technical Reports:**

Wiesemeyer, H., *Thoughts about polarization calibration with the next generation receivers at Plateau de Bure*, IRAM Technical Report 2005-0, <http://www.iram.es/GENERAL/reports/>

Wiesemeyer, H., *A Calibration Scheme for the IF Polarimeter using the Coherence Matrix Formulation*, IRAM Technical Report 2001-1, <http://www.iram.es/GENERAL/reports/>

Wiesemeyer, H., Guilloteau, S., *Simulations of interferometer pointing errors in mosaic mapping*, IRAM Technical Report, 2000