Alphabetic order (with some exceptions!):

Invited talk: Belloche, Arnaud
MPIfR, Bonn, Germany

"Complex organic molecules in hot cores"

Hot cores represent the early stage of high-mass star formation just before the nascent protostar starts to ionise its environment. These dense molecular regions are heated up by their embedded protostars. The increase in temperature activates a productive chemistry. In particular, complex organic molecules formed at the surface of dust grains during the warm-up phase are released into the gas phase where they can be probed with radio telescopes and interferometers. I will review how the study of complex organic molecules in hot cores helps us improving our understanding of interstellar chemistry. I will discuss the perspectives offered in this context by the advent of ALMA and NOEMA.

Talk: Benedettini, Milena
INAF – IAPS, Italy

"Spectroscopy of Shocks in Outflows: the case of BHR71"

In the early protostellar stages, fast jets powered by the nascent star, possibly surrounded by a wider angle wind, interact with the parental medium through bowshocks. The nature of the shock accelerating the outflow plays an important role in the dynamical and chemical evolution of the entrained gas.With Herschel we studied the physics of protostellar outflow shocks from the observation of the major line coolers with HIFI and PACS, in a broad sample of outflows. In this contribution I will present the analysis of the CO, [OI] and OH in two shock positions along the outflow of the BHR 71 protostar. The complementary capabilities in term of spatial and spectral resolution of the PACS and HIFI observations have allowed the identification of the different gas components of the shocked region and the derivation of their physical condition.

Invited talk: Cernicharo, José
ICMM-CSIC, Madrid, Spain

"The ALMA view of IRC+10216: From the external layers to the dust formation zone"

Invited talk: Chapillon, Edwige
IRAM, France

"Observations of Disk Chemistry in the ALMA Age"

Protoplanetary disks are still puzzling objects. The study of molecular emission has been proved to be an efficient tool to investigate the disks. Indeed, observations and models of the chemical content of the disks bring us information on both the physical structure and the actual molecular content of the disks, providing constraints on planets formation. However, until recently instrumentation was lacking sensitivity and angular resolution, consequently only the more simple molecules were imaged in disks. This is changing with the opening of ALMA. In this talk I will review results obtained in the last few years.

Talk: Gerin, Maryvonne
LERMA, Paris, France

"C [II] absorption and emission in the diffuse interstellar medium across the Galactic plane"

Invited talk: Goicoechea, Javier R.
ICMM-CSIC, Madrid, Spain

"Velocity-resolved [CII] emission and [CII]/FIR mapping along Orion"

The [CII] 158µm line is the most important cooling line of the cold neutral medium and among the brightest lines in photodissociation regions (PDRs). Indeed, the [CII] 158 µm line was soon realized to be very luminous, carrying from ∼0.1 to 1 % of the total FIR luminosity of galaxies. We present a ∼7.5×11.5′velocity-resolved (∼0.2 km s−1) image of the [CII] 158µm line taken with the Herschel/HIFI instrument toward the Orion. In combination with FIR photometric images of the dust emission and maps of the H41α hydrogen recombination and CO J=2-1, 8-7 and 10-9 lines, it provides an unprecedented view of the intricate small-scale kinematics of the ionized/PDR/molecular gas interfaces and of the radiative feedback from massive stars. These observations toward the closest massive star-forming region provide a unique template to understand the [CII] 158µm emission that ALMA will be routinely observe toward distant galaxies.

Invited talk: Hartogh, Paul
Max Planck Institute for Solar System Research, Lindau, Germany

"Spectroscopy of Solar System objects"

This talk will present results of the Herschel GT-KP "Water and related chemistry in the solar system" and related OT observations as well as recent solar system observations using the GREAT instrument on SOFIA. Furthermore a short summary of Rosetta findings with focus of the Microwave Instrument for the Rosetta Orbiter (MIRO) instrument will be given.

Invited talk: Indriolo, Nick

University of Michigan, Dept. of Astronomy, USA

"Galactic OH+ and H2O+: Tracing the Molecular Hydrogen Fraction and Cosmic-Ray Ionization Rate"

In diffuse interstellar clouds the chemistry that leads to the formation of the oxygen bearing ions OH+ and H2O+ begins with the ionization of atomic hydrogen by cosmic rays, and continues through subsequent hydrogen abstraction reactions involving H2. Given these reaction pathways, the observed abundances of these molecules are useful in constraining both the total cosmic-ray ionization rate of atomic hydrogen and molecular hydrogen fraction. We have surveyed OH+ and H2O+ along 20 Galactic sight lines toward bright sub-millimeter continuum sources using Herschel/HIFI, detecting absorption from both species in about 100 separate components. From these observations we investigate the distribution of cosmic-ray ionization rates and molecular hydrogen fractions in the Galactic diffuse interstellar medium.

Invited talk: Karska, Agata
Astronomical Observatory of Adam Mickiewicz University in Poznan, Poland

"Herschel / PACS view of feedback from deeply-embedded low-mass protostars"

Recent observations with Herschel / PACS reveal large abundances of warm and hot gas (T>300 K) in low-mass protostars, indicating that these are violently feeding back on their parental material (Karska et al. 2013, 2014b, in prep.). I will summarize the observations and present an overview of where we currently stand in our understanding of energetic processes in low-mass protostars. The interpretation of the data will be based on a simple radiative-transfer analysis and comparisons to available shock and PDR models with a brief discussion of the results from the more sophisticated and detailed physicochemical models. One of the key results, in terms of feedback processes, is that we need to combine the chemistry of PDR with the physics of shocks to fully understand and interpret the PACS data.

Talk: Keto, Eric
Harvard-Smithsonian Center for Astrophysics, USA

"What we learn about the earliest phase of star formation from modeling Herschel's detection of water vapor in L1544"

Herschel's detection of water vapor in the starless core L1544 allows a comparison with chemical models for oxygen species in the conditions just before star formation. Gas phase water is in equilibrium between freezing onto grains, photodissociation, and photodesorption off grains where the water molecule is created by surface reactions. The H2O(110-101) line is subcritically excited in the cold, rarefied H2, and the line brightness scales linearly with column density despite high optical depth. The water line provides information on the chemical and dynamical processes in the darkest region in the center of the starless cores at the very point of star formation. The model of supercritical starless cores in slow contraction from unstable quasi-static hydrodynamic equilibrium (Bonnor-Ebert spheres) provides a good match to the observations.

Talk: Kristensen, Lars
Harvard-Smithsonian Center for Astrophysics, USA

"Shocks in low-mass protostars: from Herschel to ALMA via the SMA"

Forming stars drive shocks into the surrounding medium through winds and jets launched close to the accreting protostar. The winds and jets interact with the infalling envelope and the surrounding cloud material on scales from less than 100 AU to several parsec. How the shocks influence the quiescent material depends on the velocity, the magnetic field and gas density, and interpreting any observations of shocks require a detailed comparison to sophisticated shock models. Through model comparison it is possible to infer how the shocks affect and feed back on the star formation process. I will discuss observations of shocks primarily towards low-mass protostars, with an emphasis on how these observations can be extrapolated to the extragalactic regime. One particular shock tracer, water, has changed the way we view feedback from low-mass protostars on their surrounding envelope, both on small and large scales, as observed with the SMA and Herschel. Finally I will discuss how high-resolution sub-mm spectroscopy can be used to directly image this feedback.

Invited talk: Lefloch, Bertrand
IPAG, Grenoble, France

Molecular complexity in Protostellar shocks

Herschel and the large ground-based millimeter radiotelescopes have revealed the important role of shocks in the chemical evolution of star forming regions. This is well illustrated by the spectral survey of the protostellar shock L1157-B1 from 672μm up to 55μm, carried out with Herschel, as part of the CHESS key project, and in the millimeter bands with the IRAM Large Program ASAI. The unprecedented sensitivity of these instruments brings new insight into the molecular content, with the detection of new molecular species, and into the physical conditions of this long studied region, thanks to the detection of hydrides (H2O, HCl,) and of high-excitation lines of heavy molecules (CO, CS, HCO+, HCN,...).
With the help of complementary molecular emission maps from the Plateau de Bure interferometer, multi- transition analysis of the line profiles permit determination of the excitation conditions in the shock region. High abundances of deuterated species and Complex Organic Molecules, some of pre-biotic interest, are detected in such environments, which unveil the chemical history of the cloud.
I will discuss the new view on the physical and chemical structure of protostellar bowshocks, which emerges from these observations, the role millimeter interferometers such as NOEMA as well as the need for future complementary instruments to get a coherent picture of protostellar shocks.

Talk: Li, Di
National Astronomical Observatories, ChAS, Beijing, China

“Probing Dark Gas Through Spectroscopy from Radio to Far IR Bands”

A growing body of evidence is suggesting the existence of so-called “dark molecular gas” (DMG), which is invisible in the most common tracer of molecular gas, i.e., CO rotational emission. DMG is believed to be the main gas component of the intermediate extinction region Av between 0.05 and 2, roughly corresponding to the self-shielding threshold of H2 and 13CO. To quantify DMG relative to HI and CO, we are pursuing three observational techniques, namely, HI self-absorption, OH absorption, and TeraHz C+ emission. We present here preliminary analysis of combined data set from Arecibo and Herschel showing the excitation conditions of and relationship between HI, OH, and C+ in DMG candidates. Through systematic “absorption mapping” by Square Kilometer Array (SKA) and ALMA, we will have unprecedented, comprehensive knowledge of the ISM components including DMG in terms of their temperature and density, which will impact our understanding of galaxy evolution and star formation profoundly.

Talk: Lis, Darek,
LERMA, France/Caltech, USA

"Ortho-to-Para Ratio in Water: From the Interstellar Medium to Comets"

Invited talk: Maret, Sébastien
IPAG, Grenoble, France

“Dense core chemistry as seen by Herschel, NOEMA and ALMA”

Dense cores represent the earliest stage of the formation of a star. Understanding their chemistry is therefore important to determine the composition of the material that will be incorporated in the protoplanetary disk, and eventually planets. In past years, significant advances have been made thanks to the Herschel Space Observatory. The abundance of water and several other key hydrides has been measured precisely in a few dense cores. Many complex organic molecules have also been detected, indicating that these species are formed earlier in the star formation process than previously thought. Thanks to their unprecedented spatial resolution and sensitivity, NOEMA and ALMA will allow for detailed chemical inventories of a large sample of dense cores, including the most distant ones. In this presentation, I will review the recent results obtained with Herschel, and I will discuss how NOEMA and ALMA are expected to improve our understanding of dense core chemistry.

Invited talk: Martin, Sergio
IRAM, France

„High-Resolution Spectroscopy of Luminous Galaxies"

Though systematic mm and submm spectroscopical studies in external galaxies have been carried out for more than a decade now, it becomes now possible to go deeper and at high "enough" resolution with new generation instruments. Thus, many projects are now aiming at the highest spatial resolution to understand the fate of the ISM in star bursting environments as well as in the presence of an active nucleus.
I will summarize the latest published ALMA results on the ISM spectroscopy in nearby luminous galaxies with the aim of discussing where are we now and what we can expect from future ALMA cycles and the, already starting NOEMA project, gazing at the northern sky.

Invited talk: Mottram, Joseph C.
Leiden Observatory, The Netherlands

"Towards a universal, predictive star-formation theory: linking low and high mass star formation"

The ultimate goal of studying star formation is to be able to predict the evolution and outcome(s) based on the initial conditions imparted to the dust and molecular gas during the formation of a molecular cloud. Though we are some way from such an over-arching understanding, significant progress has been made in the last few years on understanding the similarities and differences between young stellar objects across the luminosity range with the aid of Herschel. I will review these new results within this broader context of global star formation, and briefly discuss new efforts to build on these advances with ALMA and other facilities.

Talk: Neufeld, David
Johns Hopkins University, Baltimore, USA

"Halogen-bearing interstellar molecules and what can they tell us"

Herschel has provided a wealth of data on hydrogen fluoride (HF) and chloronium (H2Cl+) in the Galactic ISM, along with the first detections of HCl+, while ground-based radio telescopes have observed the CF+ molecular ion, which is produced by the reaction of HF with C+. HF has also been detected in nearby galaxies using Herschel, and in high redshift systems from the ground. The chemistry of halogen-bearing molecules will be discussed, along with their value as probes of physical and chemical processes in the interstellar medium of the Milky way and other galaxies, and the prospects for future observations using ALMA and SOFIA.

Invited talk: Ossenkopf, Volker
I. Physikalisches Institut der Universität zu Köln, Germany

"GREAT Results From SOFIA"

The German REceiver for Astronomy at Terahertz Frequencies (GREAT) onboard the Stratospheric Observatory for Infrared Astronomy (SOFIA) allows for the first time to obtain velocity resolved spectra at frequencies above 1.9~THz. First detections of para-H2D+, SH, and HD allow to quantitatively address questions of the cosmic ray ionization rate, the sulfur chemical network, and the deuterium reduction in the cosmic cycle. The [OI] line structure is always extremely complex, tracing different velocity components and temperature gradients through self-absorbed profiles. As main cooling line in PDR environments it can carry between 0.01 and 2% of the total FIR flux. The velocity structure of the cold gas is traced accurately through absorption in the [OI], OH, NH3 and [CII] lines. The [CII] optical depth is directly measured from the comparison to the [13CII] transitions.

As the GREAT observations trace all major cooling lines of the ISM in galaxies, we can assess the gas heating efficiency in different conditions and give a a first explanation for the FIR line deficit in luminous infrared galaxies.

Talk: Schmidt, Mirek
NCAC, Torun, Poland

"Vibronic bands of C$_3$ in translucent clouds."

We report the detection of eight vibronic bands of C$_3$, seven of which have been hitherto unobserved in astrophysical objects, in the translucent cloud towards HD~169454. Four of these bands are also found towards two additional objects: HD~73882 and HD~154368. Very high signal-to-noise ratio ($\sim$1000 and higher) and high resolving power ($R=80,000$) UVES-VLT spectra (Paranal, Chile) allow for detecting novel spectral features of C$_3$, even revealing weak perturbed features in the strongest bands. The work presented here provides the most complete spectroscopic survey of the so far largest carbon chain detected in translucent interstellar clouds. High-quality laboratory spectra of C$_3$ are measured using cavity ring-down absorption spectroscopy in a supersonically expanding hydrocarbon plasma, to support the analysis of the identified bands towards HD~169454. A column density of N(C$_3$) = $(6.6 \pm 0.2) \times 10^{12}$ cm^{-2} is inferred and the excitation of the molecule exhibits two temperature components; $T_{exc}= 22 \pm 1$ K for the low-J states and $T_{exc}= 187 \pm 25$ K for the high-J tail. The rotational excitation of C$_3$ is reasonably well explained by models involving a mechanism including inelastic collisions, formation and destruction of the molecule, and radiative pumping in the far-infrared. These models yield gas kinetic temperatures comparable to those found for T_{exc}. This presentation is an extension of paper entitled "Detection of vibronic bands of C$_3$ in a translucent cloud towards HD 169454" by M.~R.~Schmidt, J.~Kre{\l}owski, G.~A.~Galazutdinov, D. Zhao, M.~A.~Haddad, W.~Ubachs, and H.~Linnartz published in MNRAS, 441, 1134 (2014).

Invited talk: Semenov, Dimitri
MPIA, Heidelberg, Germany

"Legacy of Herschel: what we have learned about proto-planetary disk chemistry"

In my presentation, I will discuss what we have learned about physical and chemical structure of protoplanetary disks with Herschel. Despite a limited spatial resolution, being a space-borne instrument, Herschel has provided us with unique information about gas and dust content of disks that is hard to obtain with ground-based facilities. Among its major discoveries are a first measurement of gas disk mass via HD, detection of cold water vapor and water ice, temperature and kinematics measurements via warm CO and H2 lines, as well as detection of new species ([CII], [OI], CH+, etc.) in disks. These new molecular data have, in many cases, challenged our idealized theoretical understanding of key disk physical and chemical processes, and led us to new breakthroughs.

Invited talk: Sobolev, Andrey (not fully confirmed!!!)
Ural Federal University, Ekaterinburgh, Russia

„ Studies of water masers in star forming regions of our Galaxy within RadioAstron space-VLBI project"

Observations of the masers in the course of RadioAstron mission yielded detections of fringes for a number of sources in both water and hydroxyl maser transitions. Some sources display numerous ultra-compact details. This proves that implementation of the space VLBI technique for maser studies is possible technically and is not always prevented by the interstellar scattering, maser beaming and other effects related to formation, transfer and detection of the cosmic maser emission.

For the first time cosmic water maser emission was detected using space VLBI technique. Fringes from the water maser sources were detected on baselines exceeding 5 Earth Diameters (>65,000 km). This means that the angular resolution better than 40 microarcsec was directly achieved in the cosmic maser observations. The sharpest "direct" linear resolution better than 4 million kilometers was achieved in observations of the maser in Orion. Modelling of the data on Cep A water maser indicates that the source contains features with the sizes smaller than that of the Sun. Difference in velocities of these features corresponds to velocity gradient exceeding highest known values by 1-1.5 orders of magnitude.

So, the major step from milli- to micro-arcsecond resolution in maser studies is done. Existence of the features with extremely small angular sizes is established. Further implementations of the space VLBI maser instrument for studies of the nature of cosmic objects, studies of interaction of extremely high radiation field with molecular material and studies of the matter on the line of sight are planned.

Talk: Szczerba, Ryszard
NCAC, Torun, Poland

„Herschel/HIFI observations of the circumstellar ammonia lines in IRC+10216"

There is a discrepancy between the abundance of ammonia (NH$_3$) in the circumstellar envelope (CSE) of IRC$+$10216, which was derived from the lowest submilimeter rotational line and those inferred from radio inversion or mid-infrared (MIR) absorption transitions. New far-infrared (FIR), high resolution observations of ortho- and para-NH$_3$ transitions toward IRC$+$10216 were obtained with {\it Herschel}, to derive the ammonia abundance and to constrain the distribution of NH$_3$ in its envelope with intention to resolve the above discrepancy. We used the Heterodyne Instrument for the Far Infrared (HIFI) aboard {\it Herschel} to observe all rotational transitions up to level $J=3$ (three ortho- and six para-NH$_3$ lines). We conducted non-LTE multilevel radiative transfer modeling including near-infrared (NIR) radiative pumping through vibrational transitions. The computed emission line profiles are compared with the new HIFI data, the radio inversion transitions and MIR absorption lines in the ν_2 band taken from the literature. We found that NIR pumping is of key importance for understanding the excitation of rotational levels of NH$_3$. The derived NH$_3$ abundances relative to molecular hydrogen amount to $(2.4\pm0.3)\times10^{-8}$ for ortho and to $(2.6^{+0.6}_{-0.4})\times10^{-8}$ for para species and are equal within determined uncertainties. This is in a rough agreement with abundances derived from the inversion transitions, as well as with the total abundance of NH$_3$ inferred from the MIR absorption lines. Ammonia must be formed near to the central star at a radius close to the end of wind acceleration region but no larger than about 10 stellar radii (1σ confidence level) to explain the observed rotational transitions.

Talk: Szutowicz Slawomira
Space Research Centre, Warszawa, Poland

"Line profiles of water for the non-uniform density distribution in a cometary coma"

The evidence of anisotropic outgassing of comets may be interpreted with models of non-uniform distribution of activity. A new numerical model for the simulation of the optically thick water lines in cometary coma was constructed. The model is based on a non-uniform density distribution and the coupled escape probability method for treating radiative transfer. The gas density profile can be constant or vary as a function of the angle with respect to the outgassing axis. The outgassing pattern model assumes also regions differing in temperature, the density and the expansion velocity. The equations of statistical equilibrium are solved in every cells of the coma. Synthetic line profiles of water are computed at various offset positions. Effects of the physical parameters of the cometary material on the line intensity at the offset positions are discussed based on the simulated maps of the coma. For the non-uniform density distribution, the emission peak is shifted with respect to the nucleus-observer direction.

Invited talk: Teyssier, David^1, V. Bujarrabal^2, J. Alcolea^3, on behalf of the HIFISTARS^4 team

1: European Space Astronomy Centre, ESA, Madrid, Spain
2: Observatorio Astron\'omico Nacional (IGN), Alcal\'a de Henares, Spain
3: Observatorio Astron\'omico Nacional (IGN), Alfonso XII, Madrid, Spain
4: http://hifistars.oan.es/

"The HIFISTARS Herschel Key Project: a review of high-resolution spectroscopy of evolved stars with Herschel/HIFI"

The HIFISTARS Guaranteed Time Key Project (PI V. Bujarrabal) was a program devoted to the study of the circumstellar envelope (CSE) of Asymptotic Giant Branch (AGB) and post-AGBs stars with high spectral resolution using the Herschel/HIFI instrument. The sample comprises a total of 38 stars, including as well a few red supergiants and yellow hypergiants. The goal of this program was primarily to probe the emission and dynamics of abundant molecules in the warm envelope layers, which is where the gas acceleration is still taking place in AGBs, and where the recently shocked gas is found in post-AGBs. To this aim, observations of spot transitions of ^{12}CO and ^{13}CO were performed in the complete sample. On top of this, a dedicated study of the water emission in various chemical types of stars was conducted, through the observation of several transitions of ortho- and para-H$_2$O and its isotopologues. Finally additional species such as NH$_3$, HCN or SiO were also observed thanks to the broad instantaneous bandwidth of HIFI and allowed to complement the chemical inventory in those inner layers of the CSE. In this contribution I will review the main findings from this program, as well as the result from follow-up projects such as the Guaranteed Time project SUCCESS (PI D. Teyssier) and other Open Time programs that complemented the study initiated by HIFISTARS.

Talk: Tylenda, Romuald ^1, T. Kaminski^2, K. M. Menten^3, M. Hajduk^1, N. Patel^4, A. Kraus^3

1: CAMK Toruń
2: ALMA-ESO
3: MPIfR, Germany
4: CfA, USA

„A rich submillimetre molecular emission from the oldest nova-like object, CK Vul = Nova Vul 1670"

The eruption of CK Vul was observed by european astronomers (Johannes Hevelius, Giovanni Cassini) in 1670-72. In the XX century, Nova Vul 1670 was considered as a classical nova, despite its unusal light curve as for a classical nova. The light curve of Nova Vul 1670 however bears clear resemblances to that of OGLE-2002-BLG-360, which has recently been classified as a red nova, i.e. an eruption resulting from a stellar merger. No stellar-like remnant was discovered at the position of Nova Vul 1670. Only a faint nebulosity surrounding the CK Vul position was detected in the optical. We have conducted spectroscopic observations of CK Vul in the submillimetre range using APEX, as well as SMA and the Effelsberg radiotelescope. CK Vul appears as a bright and rich source of molecular emission. Almost fifty molecular lines have been identified and measured. The features are mostly produced by molecules bearing hydrogen and isotopes of carbon, nitrogen and oxygen. The lines are formed in a very cool enviroment of dust and molecules surrounding the presumable (invisible for us) main stellar remnant. The temperature of the matter was estimated to be 10-20 K, its mass can be as high as a solar mass. That large amount of molecular matter around the stellar remnant definitively excludes the hypothesis of a classical nova.

An analysis of the observational data leads to two futher important conclusions. First, the abundance of nitrogen in the matter surrounding CK Vul seems to be higher than in the standard cosmic matter.
Second, the rare isotopes of carbon, nitrogen, and oxygen, i.e. 13C, 15N, and 18O, are a dozen or so times more abundant than the standard values. This evidently shows that the matter that we see around CK Vul had significantly been processed in the thermonuclear reactions burning hydrogen in the CNO cycles. These results can be explained in the red-nova hypothesis (merger of stars) as a source of the 1670 eruption. Products of the nuclear burning in deep stellar interiors can easily be dredged up to outer regions by violent mixing processes during the merger.

Talk: Wootten, Alwyn
NRAO, USA

"Future prospects for submillimeter spectroscopic observations"

Submillimeter spectroscopy has enjoyed a golden age over the last years, with Herschel in orbit and a contingent of ground-based observatories on the ground. Interferometers have provided the spatial detail, albeit often at lower frequencies, while total power telescopes have provided testbeds for new instrumentation. The future of earth-based (sub)millimeter interferometry seems assured but the future of total power telescopes on the ground and in space is less certain. Prospects for development will be discussed.

POSTERS:

Poster: Fagas, Monika
Astronomical Observatory of Adam Mickiewicz University in Poznan, Poland

"Ro-vibrational CO emission in high-mass star forming region AFGL 4176"

High-resolution ro-vibrational lines of CO accessible from the ground trace warm gas in the central regions of high-mass protostars and thus are complementary to the recent observations from Herschel. We present VLT/CRIRES M-band spectra of AFGL 4176 targeting CO v=1,2 lines and its isotopologues. The analysis is presented for the 13CO v=1-0 lines. The line profiles are decomposed into 6 Gaussian components corresponding to various physical components. We determine rotational temperatures and column densities separately for each component using rotational diagrams and discuss their possible origin.

Poster: Kulczak-Jastrzebska, Magda
OA UJ, Krakow, Poland

"Observations of HDO in the high-mass star forming regions: G34.26, W51 and W49N"

I present observations of the ground state 1(0,1) –0(0,0) rotational transition of HDO at 464.925 GHz and the 11,0 –10,1 transition at 509.292 GHz towards three high-mass star forming regions, carried out with the Caltech Submillimeter Observatory. The latter transition is observed for the first time from the ground. The spectra are modeled, together with observations of higher-energy HDO transitions, as well as submillimeter dust continuum fluxes from the literature, using a spherically symmetric radiative transfer model to derive the radial distribution of the HDO abundance in the target sources. The abundance profile is divided into an inner hot core region, with kinetic temperatures higher than 100 K and a cold outer envelope with lower kinetic temperatures. I also use two H18O fundamental transitions observed by Flagey et al. (2013) to model the H20 abundance and to constrain the HDO/H2O abundance ratio in the outer envelopes.

Poster: Matuszak, Monika
Astronomical Observatory of Adam Mickiewicz University in Poznan, Poland

"Far infrared CO and H2O emission from intermediate mass protostars"

Intermediate-mass young stellar objects provide a link to understand how feedback from shocks and UV radiation scales from low to high-mass star forming regions. We analyze molecular excitation in a sample of intermediate mass sources observed with Herschel / PACS as part of the Water in Star Forming Regions with Herschel (WISH) program and compare to the results obtained for the low- and high-mass regions. We show that the CO and H2O excitation is similar to the central 10^3 AU of low-mass protostars and consistent within the uncertainties with the high-mass protostars probed at 3x10^3 AU scales, suggesting similar shock conditions in all those sources.

Poster: Tychoniec, Łukasz
Astronomical Observatory of Adam Mickiewicz University in Poznan, Poland

"Dissecting PDR and shock emission in high-mass protostar W3IRS5"

High-mass protostars have a dominant effect on star formation in galaxies, yet their physics and evolutionary sequence is still strongly debated. Physical processes associated with their formation such as shocks and UV / X-ray irradiation are poorly characterized due to large distances of even the closest high-mass star forming regions in our Galaxy. Those processes are best traced by molecular and atomic/ ionic emission in the far-infrared, which was recently observed by PACS instrument on Herschel with unprecedented spatial resolution and sensitivity. We present the analysis of the spectral maps of a well-studied high-mass source W3IRS5 and the comparison of line emission to the shock and PDR models. The analysis is performed separately for 25 spaxels from PACS and thus allows us to determine the physical conditions and properties of shocks and radiation as function of position from the central protostar(s) and link the results to those of extragalactic and low-mass sources.