



Contribution ID: 8

Type: **not specified**

Jets and outflows in young stellar objects in the SKAO Era

Tuesday 25 November 2025 15:30 (15 minutes)

Jets and molecular outflows are ubiquitous phenomena associated with the formation of young stellar objects (YSOs). They play a crucial role in removing angular momentum from the accreting system and in regulating star-formation efficiency. Theoretical studies and observations with ALMA and VLA have shown that jets and winds may have a crucial role in promoting dust growth in the envelope-disc system and in shaping the physical and chemical properties of the surrounding environment. Despite these significant progresses, many fundamental questions remain unanswered regarding the acceleration, collimation, and chemical impact of jets and outflows from YSOs.

From its first light in the AA* configuration, SKA-Mid will overcome the limitations of current mm/cm-facilities by enabling high-angular resolution and high-sensitivity cm-observations, crucial for probing jets and outflows near YSOs. Radio recombination lines offer a unique opportunity to study the 3D-kinematics of jets. Non-thermal linearly polarized synchrotron emission will allow measuring magnetic field strength and morphology at unprecedented scales of a few au, enabling us to test MHD models for wind's acceleration. Simultaneously, observations of dust thermal emission in outflow cavities will allow studying how dust grows and is eventually transported from the disk to the envelope and back, providing a possible solution to the long-standing challenge of dust growth in discs. Finally, the SKA-project will allow exploring the dust composition and chemical enrichment in shocks, where sputtering and shattering of grains cause the release of their mantles and refractory cores in the gas-phase. Complementary to ALMA's detection of simple and complex organic molecules at mm-wavelengths, the SKA-project will probe for the first time heavy species and give insight into the refractory material of dust grains. Molecules such as long carbon chains/rings, several S-, Al-, Mg-, and other metal-bearing species are expected to have their peak emission at frequencies covered by SKA-Mid but are missed by sub-mm facilities.

In the context of the Cradle-of-Life, this talk will discuss the revolution that SKA-Mid will enable in the study of jets and outflows from YSOs leading to a deeper understanding of the star-formation process and the evolution of the ISM in our Galaxy.

Topics

Cradle of Life & Our Galaxy

Author: Dr SABATINI, Giovanni (INAF - Osservatorio Astrofisico di Arcetri)

Co-authors: Dr BUSQUET, Gemma (Departament de Física Quàntica i Astrofísica, Universitat de Barcelona, ES); CACCIAPUOTI, Luca (European Southern Observatory); Dr CARRASCO-GONZÁLEZ, Carlos (Instituto de Radioastronomía y Astrofísica - UNAM, MX); CODELLA, Claudio (Istituto Nazionale di Astrofisica (INAF)); DE SIMONE, Marta (European Southern Observatory Garching - INAF Arcetri); Dr GIRART, Josep Miquel (Institut de Ciències de l'Espai - CSIC, ES); Dr MARTÍNEZ-HENARES, Antonio (Center of Astrobiology - CSIC-INTA, ES); Dr RODRIGUEZ-KAMENETZKY, Adriana (Instituto de Astronomía Teórica y Experimental -UNC, AR); Dr TYCHONIEC, Lukasz (Leiden Observatory, NL); Dr ANGLADA, Guillem (Instituto de Astrofísica de Andalucía - CSIC, ES); BACCIOTTI, Francesca (Istituto Nazionale di Astrofisica (INAF)); Dr BACHILLER, Rafael (Observatorio Astronómico Nacional - IGN, ES); Dr BIANCHI, Eleonora (INAF - Osservatorio Astrofisico di Arcetri); Dr BOURKE, Tyler (SKA Observatory, UK); Prof. BOVINO, Stefano (Department of Chemistry, Sapienza - Roma,

IT); Prof. CASELLI, Paola (Max Planck Institute for Extraterrestrial Physics); CAVALLARO, Francesco (Istituto Nazionale di Astrofisica (INAF)); Prof. CECCARELLI, Cecilia (Univ. Grenoble Alpes, CNRS, IPAG, FR); Ms DIAZ-MARQUEZ, Elena (Departament de Física Quàntica i Astrofísica - U. Barcelona); Prof. FACCHINI, Stefano (Dipartimento di Fisica, Università degli Studi di Milano, IT); GARUFI, Antonio (Istituto Nazionale di Astrofisica (INAF)); Dr GIANI, Lisa (INAF- Osservatorio Astrofisico di Arcetri); Dr GRETA, Guidi (Univ. Grenoble Alpes, CNRS, IPAG, FR); Prof. HIROTA, Tomoya (National Astronomical Observatory of Japan, JP); Dr ILEE, John (School of Physics and Astronomy University of Leeds, UK); INGALLINERA, Adriano (Istituto Nazionale di Astrofisica (INAF)); Dr JIMENEZ-SERRA, Izaskun (Center of Astrobiology (CAB), CSIC-INTA, ES); Dr LATTANZI, Valerio (Center for Astrochemical Studies - MPE, DE); Dr LEE, Chin-Fei (Academia Sinica Institute of Astronomy and Astrophysics, TW); LIPPI, Manuela (Istituto Nazionale di Astrofisica (INAF)); LUPI, Alessandro (Como Lake Center for Astrophysics, DiSAT, University of Insubria); Dr NARANG, Mayank (JPL/CalTech, USA); Dr OSORIO, Mayra (Istituto de Astrofisica de Andalucia, EP); Dr PINEDA, Jaime (Center for Astrochemical Studies - MPE, DE); PODIO, Linda (Istituto Nazionale di Astrofisica (INAF)); Dr PURAVANKARA, Manoj (Tata Institute of Fundamental Research, Mumbai, India); Dr RADLEY, Isaac (School of Physics and Astronomy - University of Leeds, UK); Dr RIAZ, Basmah (Universitäts-Sternwarte München - LMU, DE); RODRÍGUEZ, Luis Felipe (Centro de Radioastronomía y Astrofísica - UNAM, MX); Dr SANCHEZ-MONGE, Alvaro (Institut de Ciències de l'Espai - CSIC, ES); SANNA, Alberto (Istituto Nazionale di Astrofisica (INAF)); Dr SPEZZANO, Silvia (Center for Astrochemical Studies - MPE, DE); TESTI, Leonardo (Dipartimento di Fisica e Astronomia, Università di Bologna); Dr TOCI, Claudia (European Southern Observatory (ESO)); Dr TRAFICANTE, Alessio (INAF - Istituto di Astrofisica e Planetologia Spaziali, IT); Dr HIMANSHU, Tyagi (Tata Institute of Fundamental Research, Mumbai, India); Dr UMANA, Grazia Maria Gloria (Istituto Nazionale di Astrofisica (INAF))

Presenter: Dr SABATINI, Giovanni (INAF - Osservatorio Astrofisico di Arcetri)

Session Classification: Cradle of Life & Our Galaxy