ORIGINS Space Telescope

From the Rise of Metals to Water for Habitable Worlds

National Aeronautics and Space Administration

Origins Space Telescope: Interstellar Medium, Milky Way, and Nearby Galaxies

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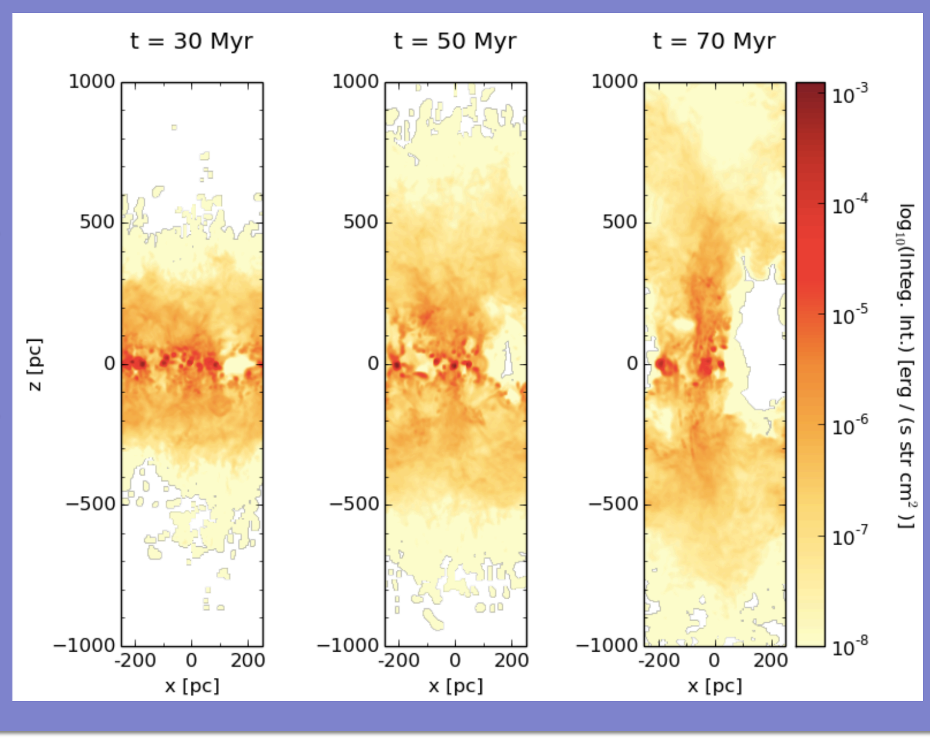
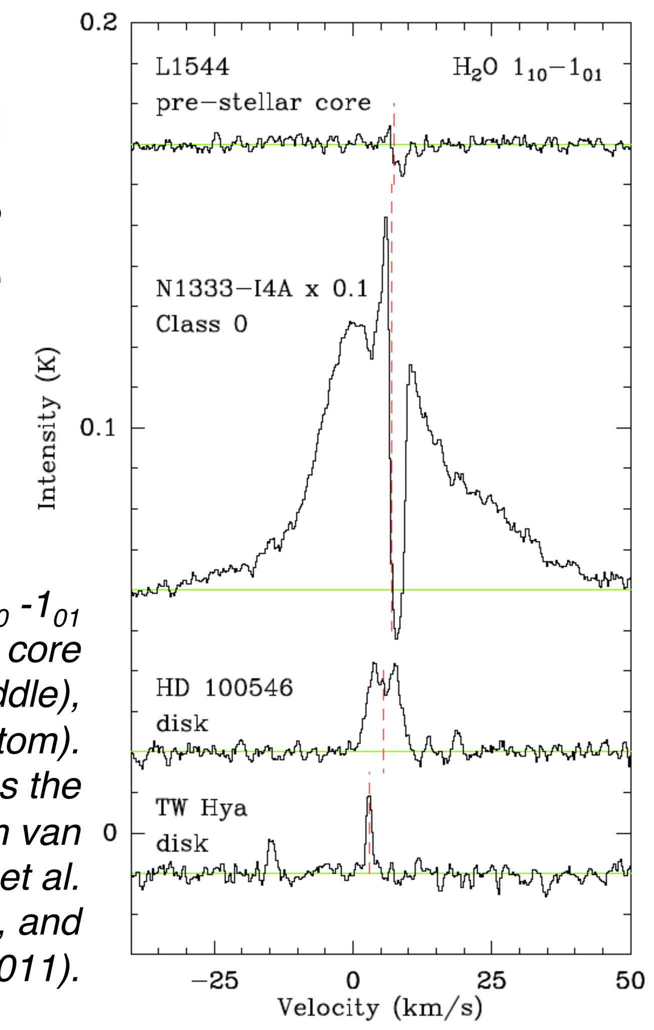
Galaxy Feedback Mechanisms at z<1: Origins will allow for a characterization of the mechanisms of feedback from AGN/star formation across the spectrum of galaxy masses and types and quantify the amount of material recycled/expelled from galaxies at z<1.

Extraplanar [CII] emission as a probe of outflow activity. Simulations of stellar feedback in a galaxy disk, showing star formation driving of galactic outflows visible in [CII] emission. (Franeck et al. in prep., Walch et al. 2015)



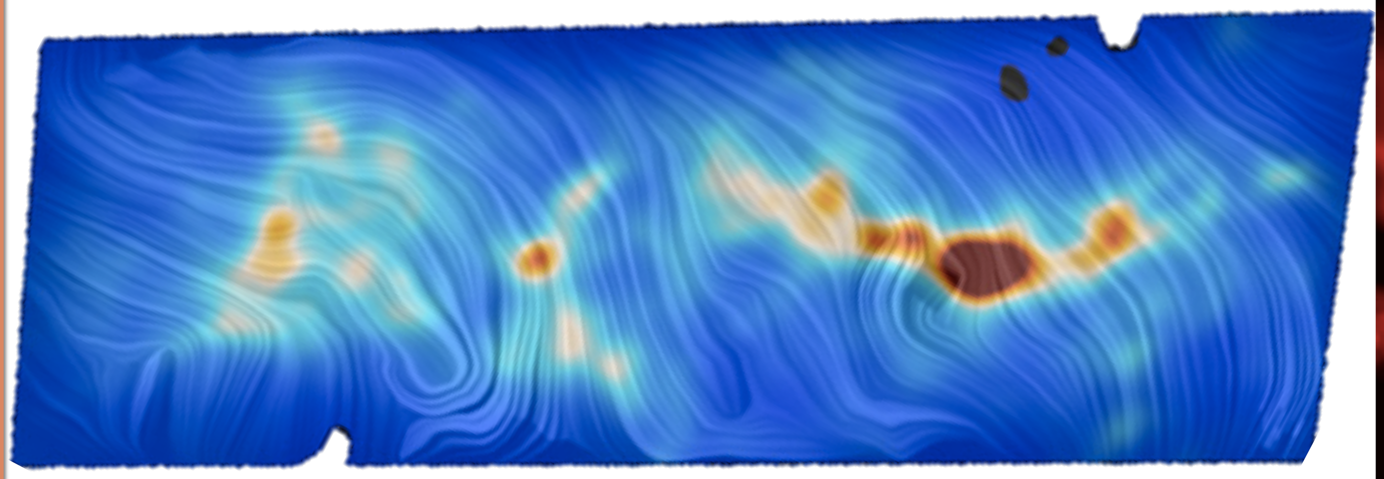
M82; Engelbracht et al. (2006) Dust in the galactic wind

Water Transport to Terrestrial Planet Zone: Observe gas-phase water in interstellar clouds and dense star-forming cores to probe critical processes related to formation and transport of water to the terrestrial planet zone, as a key input to habitability.

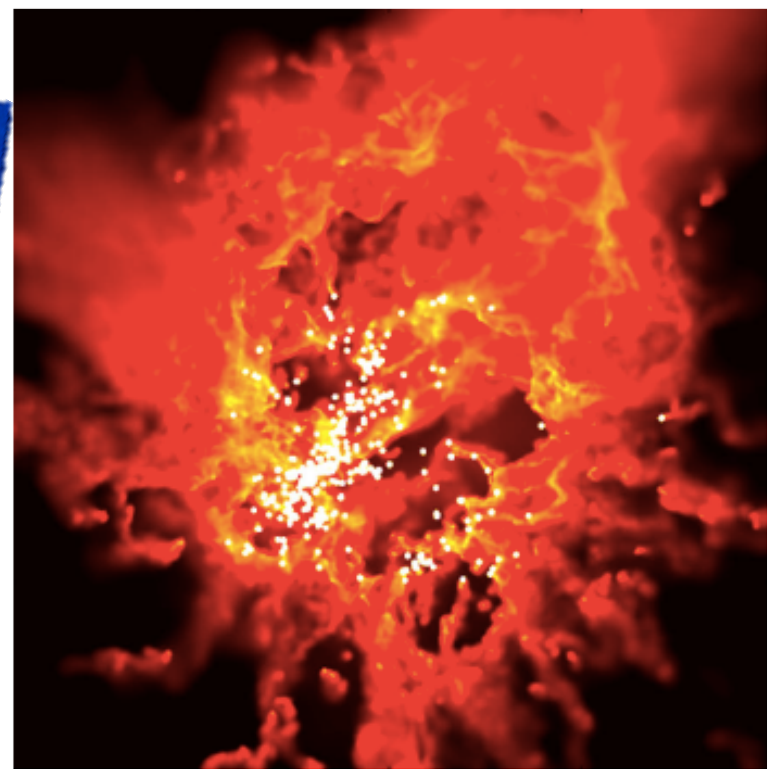


Herschel-HIFI spectra of the H_2O 1_{10} -1_{01} line at 557 GHz in a in a prestellar core (top), a protostellar envelope (middle), and two protoplanetary disks (bottom). The red dashed line indicates the systemic velocity of the source. From van Dishoeck et al. (2014), Caselli et al. (2012), Kristensen et al. (2012), and Hogerheijde et al. (2011).

Magnetic Fields and Turbulence - Role in Star Formation: The Origins Space Telescope will enable an understanding of the role of magnetic fields and turbulence in star formation, connecting galactic-scale physics to protostellar cores.



A map of inferred magnetic field lines (texture) and total intensity dust emission (color scale) in the Vela C molecular cloud, from Fissel et al. 2016. This map, made with BLASTPol (the Balloon-borne Large Aperture Submillimeter Telescope for Polarimetry) is the most detailed magnetic field map ever made for a GMC forming high-mass stars



Cloud disruption by ionizing radiation in a massive cluster; Dale et al. 2014

Regulating the Multiphase ISM: The Origins Space Telescope will establish the interstellar processes that maintain a multi-phase ISM, regulate the transition of gas between phases, and form molecular clouds.

M51 as seen with PAWS, H_2 in red and H in blue Credit: PAWS team/IRAM/NASA HST/ T.A. Rector (University of Alaska Anchorage), E. Schinnerer

How do stars get their mass?: The Origins Space Telescope will determine the relative roles of stochastic vs. secular accretion processes in forming stars. The fundamental requirement for characterizing the full spectrum of protostellar accretion variability is far-infrared photometric monitoring of protostars.

Key diagnostics for ISM, Milky Way, and nearby galaxies in the Far-IR:

- Peak and long-wavelength tail of the dust spectral energy distribution (SED)
- Dominant cooling lines for ISM gas: [CII] 158 µm, [OI] 63 µm, [OIII] 88 µm, [NII] 122 & 205 µm
- Low-lying H2O rotational lines to probe cold water in the ISM
- HD to probe total gas mass
- Dust polarization near peak of SED

Science app credits to the Origins Space Telescope ISM, Milky Way, and Nearby Galaxies Science Working Group
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The **Origins Space Telescope** is the mission concept for the **Far Infrared Surveyor**, a study in development by NASA in preparation for the *2020 Astronomy and Astrophysics Decadal Survey*.

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Secret OST Word: polarization