Ice evolution during the star formation process: An IceAge JWST study of Chameleon I

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http://jwst-iceage.org/

Icy grain mantles are the main reservoir for volatile elements in star-forming regions. The IceAge Early Release Science program [1] on the James Webb Space Telescope proposes to trace the evolution of pristine and complex ice chemistry in Chameleon I – a representative low-mass star-forming region – through various stages of star formation from dense cloud to protoplanetary disk. Observations towards the dense cloud made in summer 2022 using the NIRCam, NIRSpec and MIRI instruments provided high spectral resolution (R~1500-3000) and sensitivity (S/N>100) infrared spectra from 2.5 to 13 μm of two highly extincted background stars (Av < 100) and additional L and M band spectra towards hundreds of other field stars. In this talk, we will present the latest results of this program: a complete ice inventory towards observed lines of sight, including derived column densities for expected ice species as well as the first detection of several species along lines of sight in a quiescent cold core [2]. We will also present the perspectives for the rest of the IceAge program, focussing on mapping the spatial distribution of ices down to ~20-50 au to identify the onset of ice formation.

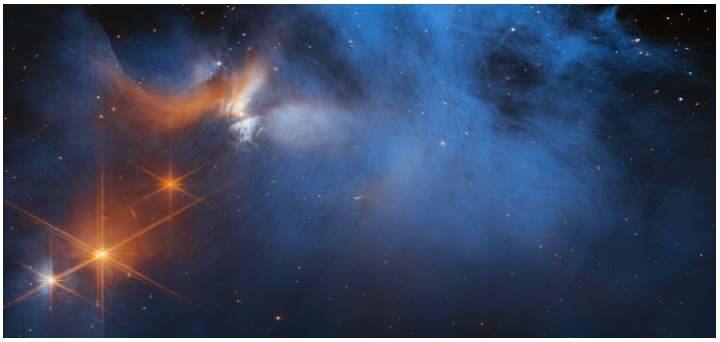

Figure 1: Star-forming region Chameleon I, imaged by the JWST NIRCam instrument.[3]

References

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[3] Press release 23/01/23 https://esawebb.org/news/weic2303/ Image Credit: NASA, ESA, CSA, and M. Zamani (ESA/Webb); Science: M. K. McClure (Leiden Observatory), F. Sun (Steward Observatory), Z. Smith (Open University), and the Ice Age ERS Team.