# OUR CHEMICAL ORIGINS

## linking the chemistry of protoplanetary disks with the fossil composition of the Solar System

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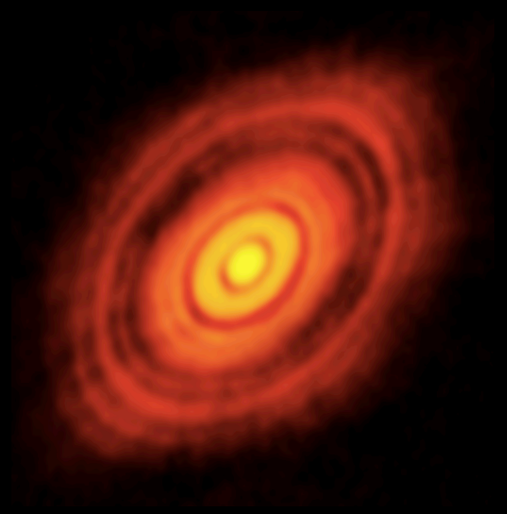
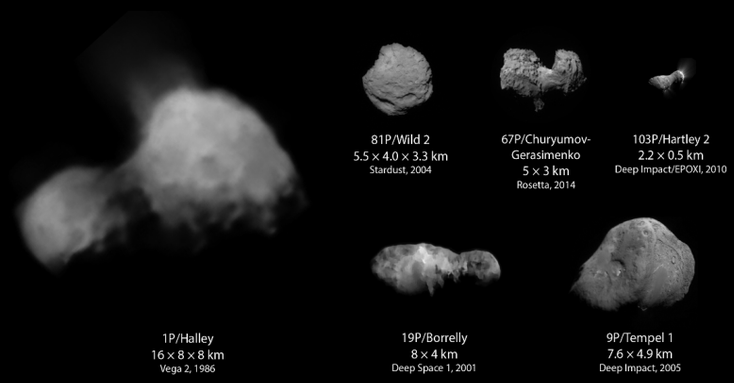
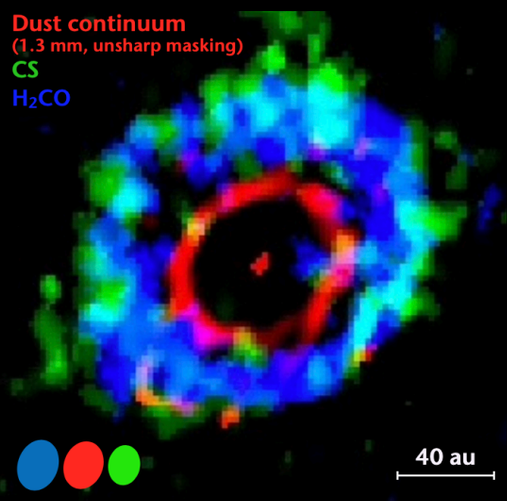
*"ChemicalOrigins" is aimed to test wether, and how much, the chemistry of the Solar System (SS) is inherited by the early phases of its formation by comparing the chemistry of protostellar and protoplanetary disks around young Solar analogs with the composition of the primitive bodies in the outer SS.*



**disk around young Solar analogues are laboratory to study dust and gas at the time of planet formation (gaps are signatures of protoplanets ?)**

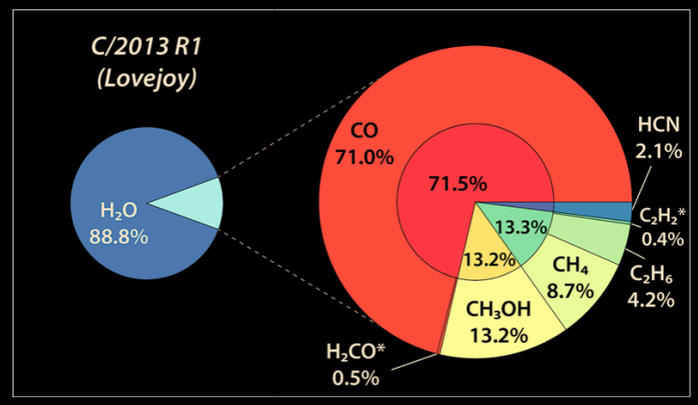
**comets are the relics of planet formation in the Solar System**



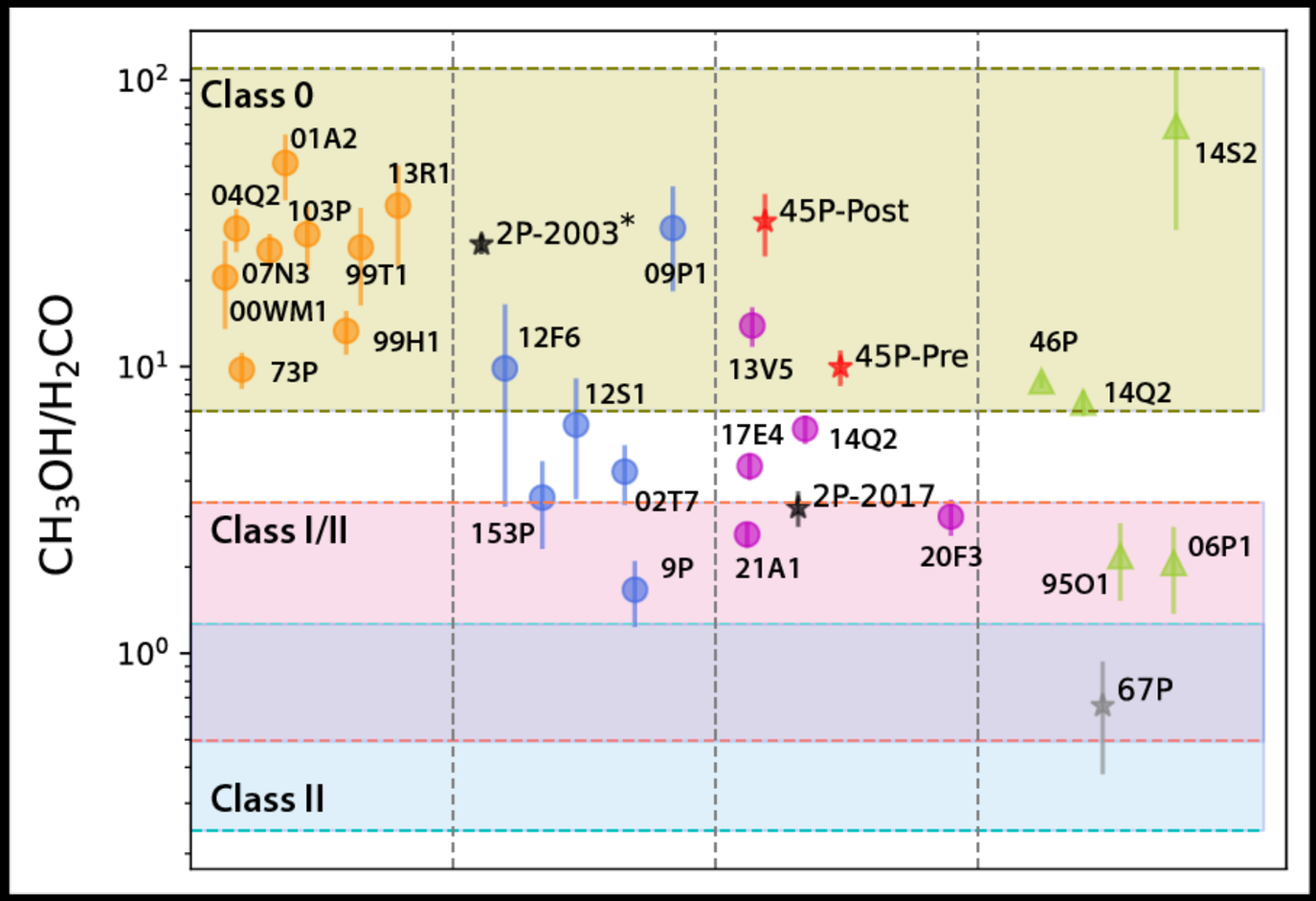

**molecules distribution /abundance in planet forming disks are derived from observations at IR, mm, cm with JWST, ALMA, VLA**

**molecules abundance in comets are derived from observations at IR and mm with VLT. JWST. and ALMA**



# Results: the abundance of simple organics in comets and disks are similar

$CH_3OH$ and $H_2CO$ are the building blocks of complex organic and prebiotic molecules, which are key for the emergency of life. They form on the icy mantles covering dust grains since the first (prestellar and protostellar) stages of the formation of Sun-like stars and may be incorporated by the disk and inherited by the forming planets.




*Lippi, Podio et al. in preparation*

*This is the first statistical comparison of $CH_3OH/H_2CO$ in disks (~15) with comets (~35)*

*The comparison suggests that cometary ices may have been inherited from the prestellar and protostellar stages of the formation of our Sun*

# What has been done & work in progress

*I plan to use the requested budget to: (i) boost my collaborations with researchers working on observations of Outer Solar System Objects (OSSOs), and on VLA data; (ii) disseminate the project results, enhancing the INAF visibility.*

- 8 refereed papers published on chemical studies of disks & comets
- collaborations with experts of outer solar system objects at OAA, OAPd, and IAPS
- supervisions of 1 PhD student and 2 postdocs on topics related with the Mini Grant project
- dissemination of the results through contributions in the following conferences:
    - FAUST Meeting: *Fifty AU STudy of the chemistry in the disks of Solar-like protostars,* Tokyo, 5-7 April 2023
    - *Protostars & Planets VII*, Kyoto, Japan, 10-15 April 2023
    - ACO Congress: *Chemical processes in Solar-Type Star forming regions II,* Toulouse, 5-9 June 2023
    - *Congresso Nazionale di Astrochimica (Proto-)Planetaria,* Trieste, 11-14 September 2023
    - *Core2Disk III,* Saclay, Paris, 9-13 October 2023
    - *The Fourth National Workshop on the SKA Project*, Catania, 27/11 - 1/12 2023
- organization of conferences covering topics related to the Mini Grant project (as member of the SOC)
    - *5th Italian Workshop of Millimetre Astronomy*, Bologna, 12-14 June 2023
    - *Congresso Nazionale di Astrochimica (Proto-)Planetaria,* Trieste, 11-14 September 2023
    - Symposium proposed for EAS 2024: *Once upon a time ... our astrochemical history,* Padova, 1-5 July 2024
    - Special Session proposed for EAS 2024: *Young protostellar disks: the initial conditions for planet formation*, Padova, 1-5 July 2024
    - FAUST Meeting: *Fifty AU STudy of the chemistry in the disks of Solar-like protostars, OAA*, 31/01 - 2/02 2024
- Obtained observing time:
    - *"Tracing the ices in the planet-forming disk V883 Ori"*, 17.1 hrs awarded at VLA, to be taken in Jan-May 2024