Exploring the Solar System with ALMA

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Ground-based (sub)millimeter observations have been extensively used to study Solar System bodies, in particular the chemical composition of their atmospheres and the thermal properties of their surfaces. The deployment of ALMA has placed this technique at the forefront for Solar System studies.
ALMA’s unprecedented sensitivity translates into the ability to look for previously undetected molecules in dense planetary atmospheres, but also in tenuous and/or distant atmospheres of bodies such as Kuiper Belt Objects. Its exquisite spatial resolution enables high-resolution mapping of ice giants and moon's atmospheres. Surface mapping on dwarf planets such as Pluto, or on asteroids, can also be performed to reveal the distribution of surface properties such as albedo and thermal inertia. Overall, these new studies are highly complementary to planetary spacecraft observations, and can contribute to identify and understand atmospheric and surface processes .
The importance of ALMA for Solar System studies has been evidenced by the many successful projects carried out in its first three observation cycles. I will provide an overview of the results achieved so far, spanning a diversity of topics such as the chemistry of cometary comae, the composition of the atmospheres of Pluto and large moons (Io, Titan), atmospheric dynamics in Venus and surface thermal mapping on large asteroids Ceres and Juno.