STARPLAN
CENTRE FOR STAR AND PLANET FORMATION
A research centre for cosmochemistry, astrophysics and astronomy
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Research highlights for 2015

Growth of asteroids and planetary embryos fuelled by small glass beads

Asteroid fragments that fall to Earth as chondrite meteorites often contain tiny, round beads known as chondrules that formed when molten droplets quickly cooled in outer space during the solar system's early years. A new study from an international team that includes scientists from StarPlan suggests chondrules may be responsible for the formation of giant asteroids and the planetary embryos that collided to form rocky planets like Earth. Using numerical simulations, they showed that the growth of Mars-sized planets – fuelled by accretion of chondrules – may have been completed as early as ~3 Myr after the birth of our Sun. These results were published in the inaugural issue of the journal *Science Advances*.

Rapid accretion and melting of protoplanets

A decades long debate about the amounts and degree of homogeneity of the short-lived radionuclide ^{26}Al has important implications for its use as a chronometer and the amount of energy available to drive planetary differentiation. By Pb-Pb dating and analyzing the Al-Mg isotopes of an ancient basaltic angrite, a study led by StarPlan researchers shows that the amount of ^{26}Al was homogeneously distributed in the protoplanetary disk and present in amounts four times lower than commonly assumed. This result precludes the use of ^{26}Al as a chronometer and requires that protoplanets were already forming within 250,000 years of the Sun's formation. The paper was published in the journal *Earth and Planetary Science Letters*.

Discovery of prebiotic chemistry around a low-mass protostar

Glycolaldehyde is a key molecule in the formation of biologically relevant molecules such as ribose. In a paper published in *Astronomy & Astrophysics*, StarPlan scientists report the discovery of glycolaldehyde in a deeply-embedded low-mass protostar, which is only the second time that this prebiotic molecule is detected around a Sun-like star. By further analysing other complex organic molecules, the team found that the relative abundance of glycolaldehyde to other complex molecules is highly variable and possibly modulated by the luminosity of the protostar. These results emphasise the range of physical conditions necessary for the preservation of prebiotic chemistry in early form disks.