# Constraining Ryugu's earliest fluid composition by the analyses of phosphates

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Volatile elements and compounds like F, Cl, S, $H_2O$ and $CO_2$, indisputably exert a strong influence on the nature and evolution of (exo)planets, of which water is arguably the most prominent for the habitability of the Earth. Most volatiles were likely brought to Earth by carbonaceous chondrite-like material, including asteroids, making the undisturbed material of Ryugu key samples to improve our understanding of the distribution of water in our solar system and the origin of water on Earth.

The water concentration in CI chondrites is distinct from that of Ryugu (13 to 20 wt% compared to 6.8 wt%, respectively; [1,2]), which might be explained (i) by loss of water from Ryugu during the disruption of the parent body, (ii) impact heating, (iii) that CI chondrites derive from parent asteroids with higher water content than Ryugu, or (iv) that CI chondrites got contaminated by water during their residence time on Earth [2-4]. Importantly, the apatite grains found in Ryugu likely originate from the aqueous alteration of Ryugu that predates the events that might have lead to the loss of some of Ryugu's water inventory (see points i and ii, [5,6]). Thus, measuring the chemical and isotopic compositions (e.g. H, O, etc) of these apatites will likely help to better constrain the initial composition of Ryugus water, prior to its disruption, which is the aim of different research projects currently ongoing.

We will present the developed method on how we measured the H-isotopic composition of the apatites in Ryugu and discuss this preliminary results in the context of the initial dD value of Ryugu's water.

**References**

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