The relatively recent discovery of gas (carbon monoxide) in debris disks is revolutionizing our understanding of how systems evolve after the primordial disk has dissipated. The mechanism by which this gas forms through the sublimation of CO ice is well-supported by comparisons with observations. The observed disks are cold and located in the outer regions of their systems. However, there are also belts closer to their stars, near another ice line—the water ice line. This is notably the case in the solar system with the asteroid belt. Thus, Kral et al. 2024 proposed a new mechanism explaining the origin of water on Earth through the formation of a secondary water-gas disk in the solar system.

We propose to extend the study of these types of disks to extrasolar systems. This mechanism is indeed more universal than the collision mechanism usually used for the Solar System since it doesn't need dynamical evolution of outer planets to operate. A detection of such disc around extrasolar system would also be very interesting regarding the formation of our own system.

We have therefore modeled the evolution of such disks based on their characteristics, particularly the mass of the central star. The goal is to determine the typical characteristics of these secondary water gas disks and, in particular, to predict whether and when they are observable. We also have estimated the amount of water accreted by putative inner planet that can eventually be turned from a dry planet to an ocean planet.

This work will finally provide a very interesting bases to prepare observations with current (ALMA and JWST) and future (ELT) facilities.