Early Evolution of Venus and Earth Constrained by the Reproduction of Measured Ar, Ne isotope and K/U Elemental Ratios

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It is shown that the measured present day atmospheric Ar, Ne isotope ratios and elemental K/U ratios in the surfaces of Venus and Earth can be reproduced by a combination of EUV-driven hydrodynamic hydrogen escape and impacts that were involved in the accretion of both planets. It is found that both protoplanets formed within the solar nebula and accreted masses that could capture thin hydrogen envelopes that were lost during a few 10s of million years after the disk evaporated. It is found that a denser primordial hydrogen dominated atmosphere surrounded early Venus compared to a less massive proto-Earth that accreted its final mass by pre-fractionated dry impactors and about 2 percent carbonaceous chondrites after the thin primordial hydrogen envelope was lost. The results are also in agreement with hafnium-wolfram isotope chronometric evidence that favours a fast accretion scenario of the Earth with a late Moon-forming impact. The talk concludes with a discussion on the implications of these findings in relation to planetary evolution of terrestrial exoplanets and their potential habitability.