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Noble gas signature of the Late Heavy Bombardment in the Earth's atmosphere

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Abstract. The Lunar cratering record is consistent with the occurrence of a late heavy bombardment (LHB), which marked the end of terrestrial accretion 3.8 billion years ago. However, clear evidence of a LHB on Earth has not yet been identified. Based on a volatile budget of the terrestrial mantle, the atmosphere and hydrosphere we propose that the LHB indeed occurred on Earth and that we are breathing its aftermaths. The terrestrial atmosphere and hydrosphere is enriched in noble gases due to the abundance of volatiles in the mantle. This enrichment is consistent with the mass delivered to Earth during the LHB, as recently proposed by dynamical modelling (Gomez et al., 2005), if this material comprised Kuiper-belt (cometary) objects (KBOs) mixed in with a population of chondritic (i.e. asteroidal) impactors. The fraction of KBOs necessary to account for the atmospheric composition is, however, much lower (around 50%) than the one (~50%) inferred from modelling.

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