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# High MIF atomic oxygen ions in Earth Wind (EW)

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We previously suggested that oxygen with highly mass-independently fractionated O ( $\Delta^{17}$O $\sim$25 permils) found on lunar metallic particles were attributable to terrestrial oxygen transported by Earth Wind (EW). The recent observation of ions escaping from the Earth's ionosphere by GEOTAIL mission shows that oxygen ions in the EW can account for the amount of the MIF oxygen implanted in lunar metals. If the isotopic composition of the $O^+$ amounts to $\Delta^{17}O > 25$ permils, this would give a robust support for the EW-oxygen hypothesis. Current information on the isotopic composition of O either by measurements or theoretical calculation is limited to $<$ 100 km, and is not useful in accessing the isotopic characteristics of EW-O, of which escaping must start above 100 km. We make a 1d ion-neutral chemical simulation for oxygen and nitrogen processes in the high altitude of 100-800 km and report the result of this first attempt focusing on isotopic compositions of $O^+$. We solved 20 sets of photochemical equations for several species including oxygen isotopes in a local equilibrium condition. Inspired by the insightful interpretation of MIF in ozone layer by Gao and Marcus (2001), we examined dependence of the isotopic composition of $O^+$ on the isotopic effect of reaction ratesfor $O^+ + O_2 \rightarrow O_2^+ + O$. The $\Delta^{17}$O values of $O^+$ around 300 km of its density peak amounts to $>$ 20 permils, provided that the reduction by the above isotopic effectis about 10% than the standard one. We also discuss the feasibility of this assumption through the chemical reaction theory. If the hypothesis were confirmed, this would yield unparalleled means to tackle the biotic atmospheric evolution in the Earth through lunar soil studies.