ISOTOPIC ZONING IN THE INNER SOLAR SYSTEM.

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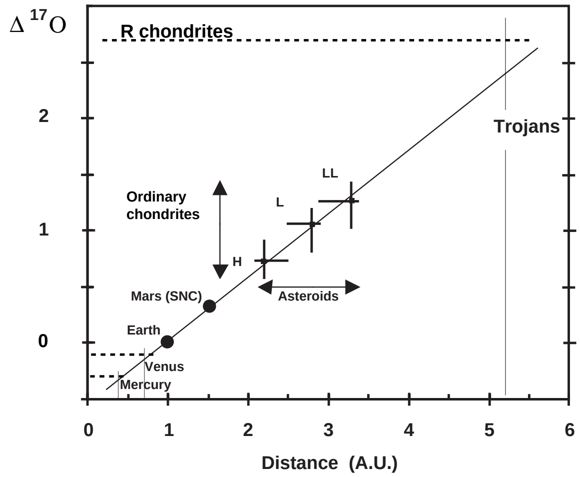
Introduction: The main lines of meteorite classification rest upon chemical criteria. Primitive meteorites or chondrites derive their composition directly from the solar nebula without differentiation processes in their parent body (e.g. no core extraction). Chondrites are distinguished from differentiated meteorites (achondrites and siderites).
More detailed studies of chondrites showed they could be separated into a number of classes, the most effective criterion for that being the oxidation state of iron, which can be either combined as a metal alloy (with Ni) or with sulfur or oxygen. In this latter case it enters the constitution of Fe-Mg silicates, like olivine. The following major groups are distinguished: carbonaceous chondrites wherein Fe is completely oxidized or nearly so, ordinary chondrites which are intermediate and enstatite chondrites in which Fe is not combined to oxygen. These wide groups are further divided into classes using more subtle criteria, specific to each group. The most abundant meteorites by far, are the ordinary chondrites. Enstatite chondrites are least frequent but statistical considerations lead to conflicting views: If one class is poorly populated, one may argue that it is a curiosity, not an important one. Conversely one can say that this results from their great success in forming larger parent bodies and their study is therefore of utmost importance to the understanding of planetary bodies. According to this view, ordinary chondrites are expected to stem from the main asteroid belts. Accretion in this region has been highly perturbated by the vicinity of Jupiter so that no massive planet could emerge. Chondrites from this region can therefore be viewed as leftover from the planetary formation.
This discussion is supported by prejudices on the way the solar system evolved and planets formed; it is established on chemical and mineralogical criteria. For a few decades, oxygen isotopes have been used and confirmed the rationality of this classification since a new criterion independent from the chemical composition permitted to separate the same classes but the rationale behind it is not well understood.

Facts: After a rapid review of relevant isotopic data [1-4], especially the new data on achondrites [1,2], a strong correlation of 17O with distance from the sun appears. Zoning of the present day solar system is established and discussed. Oxygen isotopic compositions are fundamental data which permit to establish that the primitive solar system was isotopically zoned as a result of binary mixing. This is still visible in the present day planetary compositions from Mercury to Mars and the asteroid belt. This observation leads to the



question of how did this zoning originate? The other question is how do carbonaceous chondrites fit in this picture?

Coclusions: According to this solar system zonation model we have to admit that our speculations on parent bodies of achondrites have to be revised: HED are from Mercury and angrites from Venus.

References:

[1] R.C. Greenwood, I.A. Franchi and A. Jambon (2003) *Meteoritics & Planet. Sci., 38,* A96 . [2] U.H. Wiechert et al. (2004) *Earth Planet. Sci. Lett.*221, 373-382. [3] R.N. Clayton and T.K. Mayeda. (1983) *Earth Planet. Sci. Lett.*62, 1-6. [4] R.N. Clayton and T.K. Mayeda. (1996) *Geochim. Cosmochim. Acta*, 60, 1999-2017.