Enstatite chondrite and related Earth Models. J.Wade[1],T.R.Elliott[2], B.J.Wood[1] and M.J.Walter[2] [1]Dept of Earth Science, University of Oxford, OX1 3PR (jon.wade@earth.ox.ac.uk), [2]Dept. Of Earth Science, University of Bristol.

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Geochemical models of the Earth have traditionally been based on CI chondrite bulk compositions even though such models are a poor 'fit' for the oxygen isotopic composition of the planet. Recent data show that the isotopic composition of Cr, Ni and Ti in the bulk silicate Earth (BSE) are also inconsistent with the CI chondrite model which means that, despite the agreements in ratios of refractory lithophile elements between BSE and CI's, a better Earth model is required.

In contrast to CI chondrites, Enstatite chondrites have oxygen isotopic compositions in agreement with those BSE (Javoy 1995) and recent results for Cr, Ni and Ti confirm the close relationship between Earth and this meteorite class. Furthermore, the earliest stages of core segregation on Earth appear to have taken place under strongly reducing conditions (Wade and Wood 2005), similar to those produced by re-equilibrating E-chondrites. The latter conclusion was derived from the metal-silicate partitioning behaviour of different siderophile elements. When metal-silicate partitioning data for Ni, Co, V, Cr, Nb, W and Si are taken together, the most plausible explanation for the observed depletions of these elements in the BSE is that conditions were initially reducing and became more oxidising as accretion progressed (Wade and Wood 2005).

Despite these lines of support for the Enstatite-chondrite Earth model, we can find no way to reconcile the bulk compositions of E-chondrites with those of the bulk Earth even if the most extreme compositions are taken as a starting point. The Earth's mantle would have to have a marked layering in Si (Javoy 1995) which is virtually impossible to reconcile with seiemological observations.

Our approach, starting with the enstatite chondrite model, has been to consider mixtures of meteoritic components which generate the right O, Cr, Ni and Ti isotopic composition of the Earth, together with the "right" balance of siderophile and volatile element concentrations. We find that various combinations of ordinary and carbonaceous chondrites can satisfy the isotopic and refractory element constraints, and that we need to apply a volatile element balance in order to derive tighter constraints. We will argue that significant volatile loss from the Earth has not occurred so that a volatile mass balance constraint is reasonable.

Javoy, M. (1995). Geophysical Research Letters **22**(16): 2219-2222.

Wade, J. and B. J. Wood (2005). Earth And Planetary Science Letters **236**: 78-95.