

MHD TURBULENCE AND THE FIP EFFECT

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The “FIP Effect” is the elemental abundance anomaly observed in the solar corona and slow speed solar wind, whereby elements with First Ionization Potential (FIP) less than about 10 eV (e.g. Mg, Si, Fe) are enhanced in abundance by a factor of about 3. Elements with FIP higher than 10 eV (e.g. C, N, O) are essentially unchanged. This fractionation is assumed to occur in the solar chromosphere, since the low FIP elements are predominantly ionized here, while the high FIP elements are neutral. The abundance enhancement is currently explained by the upward action of the ponderomotive force on chromospheric ions, but not neutrals, as Alfvén waves generated in the corona reflect from the steep chromospheric density gradients at each footpoint. The fractionation so produced is almost independent of ion mass as observed, and is stronger for closed coronal loops than for open field lines, also as observed.

I will describe some recent results from models of the FIP effect, including the role of slow mode waves generated by the ponderomotive force of coherent Alfvén waves in saturating the abundance enhancement. Work supported by NASA Contract NNGH05HL39I, and by basic research funds of the Office of Naval Research.