Reconstruction of magnetic clouds with two spacecraft: Examples from WIND-ACE and STEREO-WIND

C. Möstl (1,2), C.J. Farrugia (3), A. Galvin (3), K.E.J. Huttunen (4), J.G. Luhmann (4), H.K. Biernat (1,2)

(1) Institute of Physics, University of Graz, Universitätsplatz 5, A-8010 Graz, Austria, (2) Space Research Institute, Austrian Academy of Sciences, Schmiedlstrasse 6, A-8042 Graz, Austria, (3) Space Science Center and Dept. of Physics, University of New Hampshire, Durham, NH 03824, USA, (4) Space Sciences Laboratory, University of California, Berkeley, CA, USA, (moestlch@stud.uni-graz.at)

The Grad-Shafranov technique has been used in the interplanetary medium to reconstruct magnetic flux tubes such as magnetic clouds from single spacecraft data. In a magnetopause context, it has been extended and made more robust by incorporating measurements of a nearby spacecraft to optimize the invariant axis and thus get a more reliable magnetic field map. We now initiate such an investigation for the solar wind. To this end, we select three magnetic clouds, of different sizes, seen by both WIND and ACE, when their separations where largest. These separations are still much smaller than the estimated scale sizes of the events, making our intentions feasible. We carry out this "merging"-technique and undertake a quantitative comparison of the improvements thus obtained by comparing the individual results of the GS technique in a single-spacecraft implemetation. We further compare the "merged' results on orientation and impact parameter with minimum variance analysis and linear force-free fitting. We also take a first look at the event on May 22, 2007, seen by WIND and STEREO-B. A magnetic field map is obtained from STEREO-B plasma and magnetic field data, delivered by the PLASTIC and IMPACT instruments. We then optimize this field map by checking the consistency with observations by WIND.