

Structure and Dynamics of Coronal Plumes and Inter-plume Regions in Solar Coronal Holes

Abstract

Coronal plumes, which extend from the solar photosphere into the high corona and possibly the solar wind, can be studied in detail with modern telescopes and spectrometers on spacecraft. Nevertheless, despite a large amount of data on these prominent features, their source is not understood. It is not even clear whether plumes contribute substantially to the fast solar wind known to emanate from coronal holes. An understanding of the processes of plume formation and evolution requires a better knowledge of the physical conditions in plumes and the surrounding inter-plume environment, specifically, of the electron densities and temperatures, the effective ion temperatures and non-thermal motions, the plume cross-section relative to the size of the coronal hole, and the plasma bulk speeds; as well as any signature in the solar wind. The goals of the proposed International Team are: (1) to review the observations of plumes and the inter-plume medium in coronal holes as well as those related to plume signatures in the solar wind and their past interpretations; (2) based on the results, it might be appropriate to suggest additional observations taking advantage of the favourable time around the solar activity minimum near 2007. Members of the team are associated with many of the relevant spacecraft instruments. Such observations would also be a component of the International Heliophysical Year (IHY 2007); and (3) as the final steps, to interpret the observations within a theoretical concept for plume formation and dynamics, and prepare the publication of the results. For the latter tasks the existing data are sufficient.