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Solar Windsocks: Estimating Solar Wind Speeds from Comet Ion Tail Images

Geraint H. Jones (1,2), B. Bentley (1), Y. Ramanjooloo (3)
(1) Mullard Space Science Laboratory, University College London, UK, (2) Centre for Planetary Sciences at UCL/Birkbeck, London, UK, (3) IfA, University of Hawai'i, USA (g.h.jones@ucl.ac.uk)

Abstract

As part of the Europlanet 2020 Research Infrastructure Planetary Space Weather Services (PSWS), University College London's Mullard Space Science Laboratory (MSSL) is making available software to estimate the speed of the solar wind at comets by measuring the orientation of their ion tails. As ion tails are cometary ions flowing downstream of the comet carried by the solar wind, images of the tails can provide a great deal of information about the solar wind speed at the comet. Software has been developed that allows the user to trace the ion tail, and, using information on the comet's position and velocity at the time the image was taken, allows estimates to be made of the solar wind speed at the comet's location in the inner heliosphere. These estimates can complement more accurate but limited measurements of the solar wind by spacecraft. We describe the software, its use, and limitations. The latter includes complications that arise when the solar wind flow is not purely radial, and difficulties in the use of the software when the Earth is crossing the plane of the target comet's orbit.

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