THE STRUCTURE OF THE INNER HELIOSPHERE AS REVEALED BY AMATEUR ASTRONOMERS' IMAGES OF COMETS. Y. Ramanjooloo[1, 2] (yr2@mssl.ucl.ac.uk), G. H. Jones[1, 2], A. J. Coates[1, 2], M. J. Owens[3], [1]Mullard Space Science Laboratory, Department of Space & Climate Physics, University College London, Holmbury St. Mary, Dorking, Surrey RH5 6NT, UK, [2]The Centre for Planetary Science at UCL/Birkbeck, Gower Street, London, WC1E 6BT, UK, [3]Dept. of Meteorology, University of Reading, UK.

Introduction: Comets' plasma tails have been studied as natural solar wind probes since the mid-20th century[1]. The appearance, structure, and orientation of a plasma tail are primarily controlled by local solar wind conditions. When the observing geometry is ideal, the direction and dynamics of the tail can reveal temporal and spatial variations in the solar wind flow local to the comet. These variations can be manifested as tail condensations, kinks, and disconnection events.

Amateur images of comets obtained with modern equipment and sensors are arguably better in quality than professional images obtained only 2-3 decades ago. Astrometry.net[2] provides automatic recognition of any star field and determines the field of view, plate scale and orientation almost instantly. We derive solar wind velocity estimates from amateurs' images of C/2001 Q4 (NEAT) and C/2004 Q2 (Machholz), and compare them to observed and modeled[3] near-Earth solar wind data. A significant proportion of our high quality dataset originates from the dedicated Japanese amateur astronomer community. We present evidence of a heliospheric current sheet-related disconnection event for comet Machholz on the 9th and 10th of January 2005, which was well observed by both Japanese and international efforts. We attempt to show the validity of amateur images of comets as diagnostic tools to understand solar wind variability in the inner heliosphere.

Our unique analysis technique offers an opportunity to investigate historical images of comets as they provide snapshots of the variability of solar wind conditions over past solar cycles, e.g. latitudinal variations of the solar wind, heliospheric current sheet sector boundaries and the boundaries of transient features, such as coronal mass ejections and corotating interaction regions.

We also include results for comet C/2011 W3 (Lovejoy) using recent images from heliospheric imagers and coronagraphs aboard STEREO A and B and SOHO. This provides the perfect opportunity to deduce the solar wind velocity close to the Sun and to validate our technique from three different vantage points.

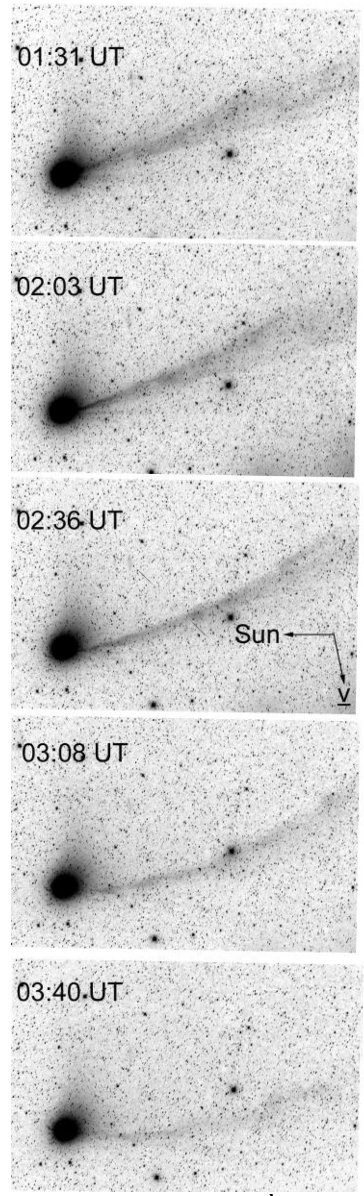

Fig 1: Comet Machholz on 18th January 2005. Image by W. Koprolin

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