

From a double streamer to a pseudostreamer

L.A. Rachmeler, S.J. Platten, C.W. Bethge, D.B. Seaton, A.R. Yeates

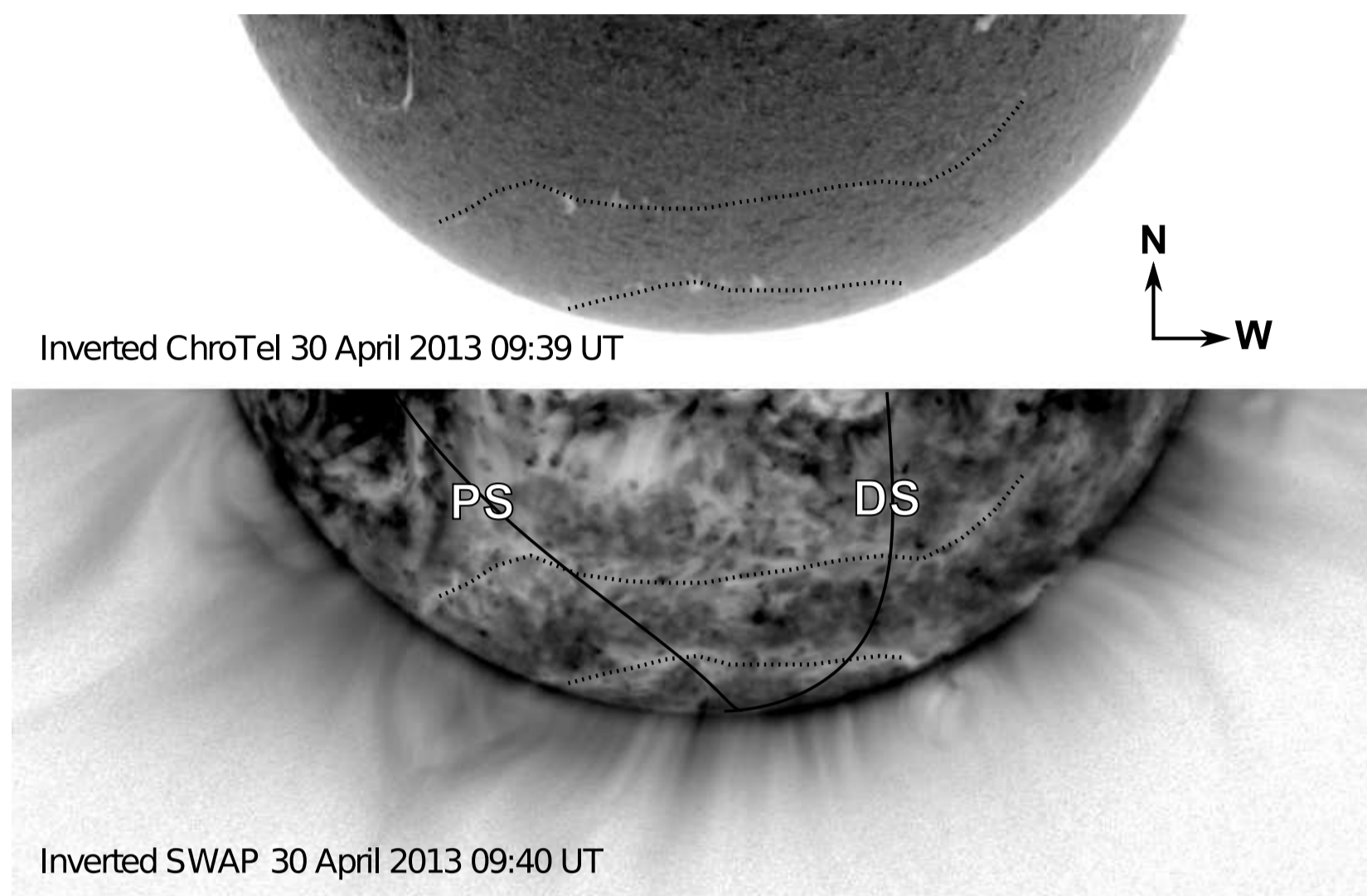
Royal Observatory of Belgium
rachmeler@oma.be

University of St. Andrews, Scotland

Kiepenheuer-Institut für Sonnenphysik, Germany

Royal Observatory of Belgium

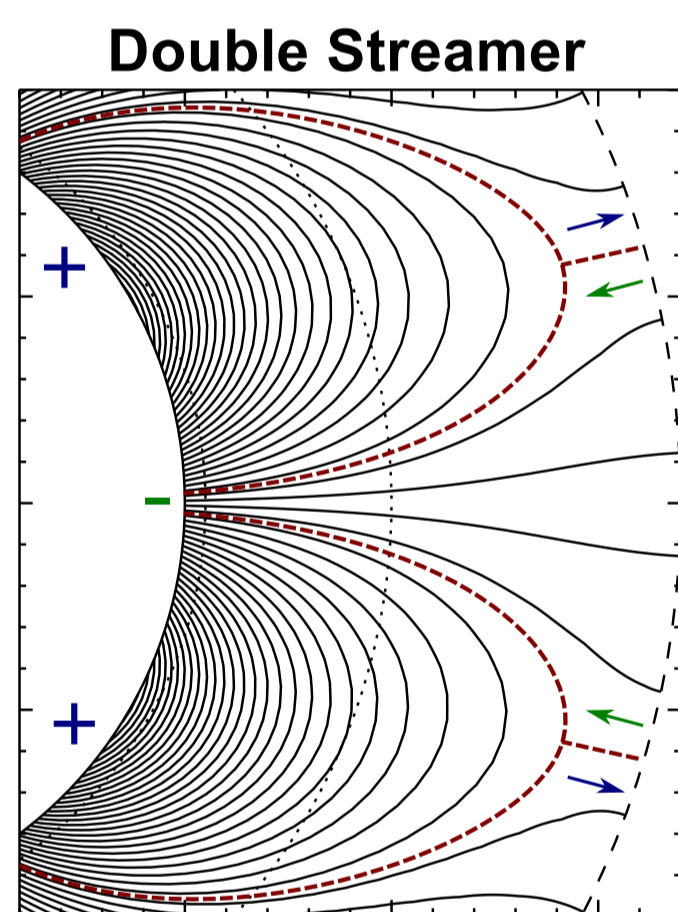
Durham University, England



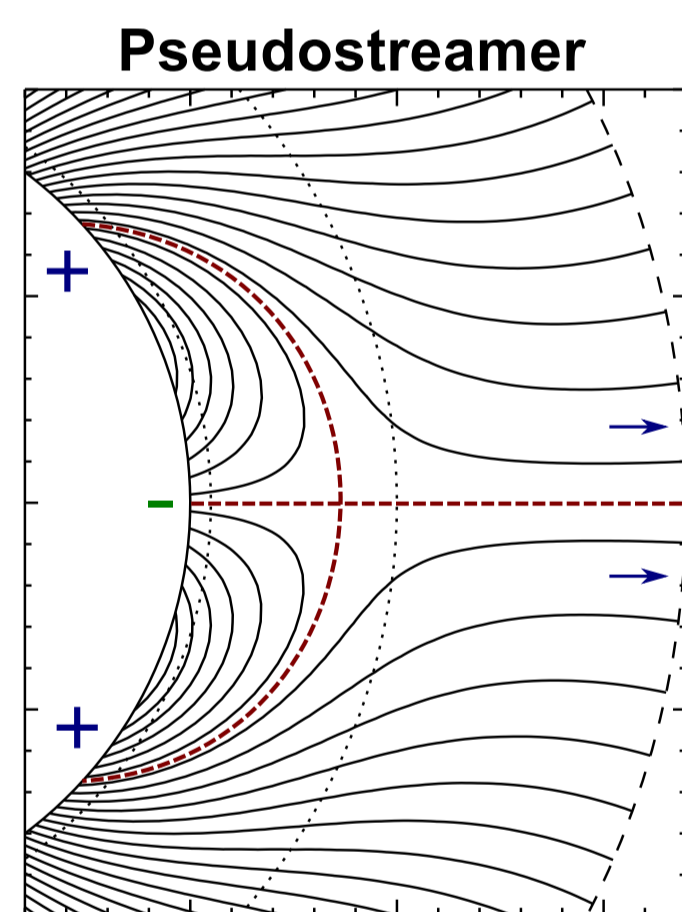
We present an observation of a single hybrid magnetic structure consisting of two polar crown filament channels. At the structure's western edge, the magnetic configuration above the channels is a **double streamer (DS)**, and at the eastern edge, it is a **pseudostreamer (PS)**. We believe this is the first clear identification of a structure like this.

On the left is a ground based H-alpha ChroTel image and a 17.4 nm EUV image from SWAP onboard the PROBA2 satellite of the structure when it was on disk. The dotted lines trace the filament channels. The solid lines show the longitudes where the structure was observed as a double streamer (5 May) and later a pseudostreamer (10 May) as the sun rotated. Below, we also present data from CoMP, which observes coronal polarization in the IR FeXIII 1074 nm emission line. Coronal polarization is directly sensitive to the magnetic field.

The two edges of the structure are similar, but *topologically distinct*. The west edge is a double streamer that has open field between the filament channels, whereas the east edge is a pseudostreamer which does not.



Helmet streamers have closed arcade-like field under an extended plasma sheet / current sheet that separates two coronal holes of *opposite polarity*.

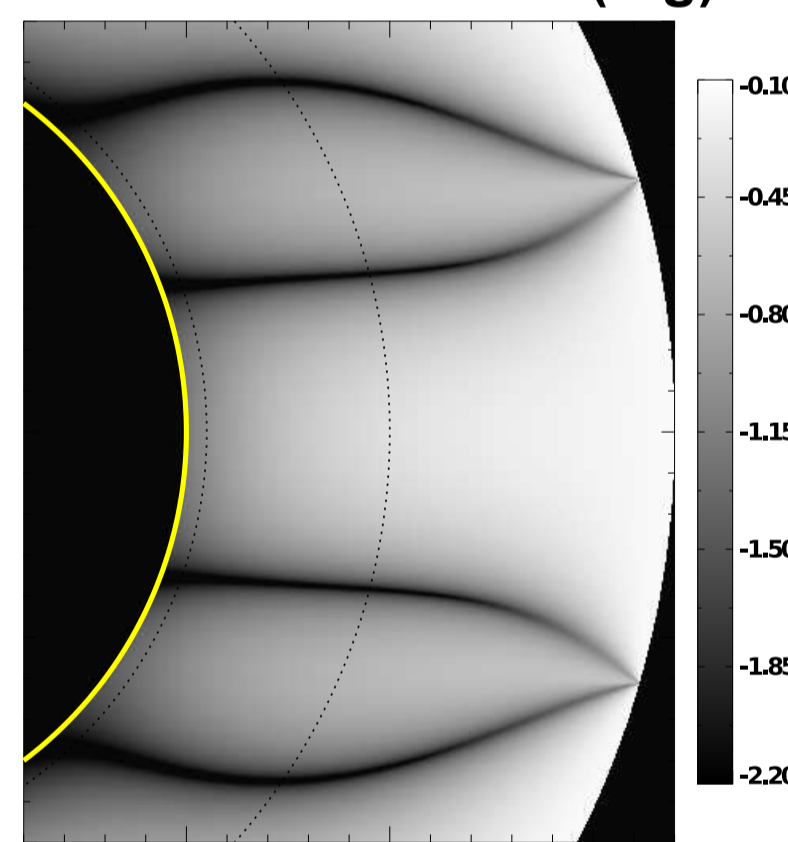


Pseudostreamers have two closed arcades underneath an extended plasma sheet that separates two coronal holes of the *same polarity*.

Below are simulated coronal polarization observations of the two magnetic configurations on the left. Linear polarization (L) contains information about the direction of the field integrated along the LOS. Nulls in L occur when:

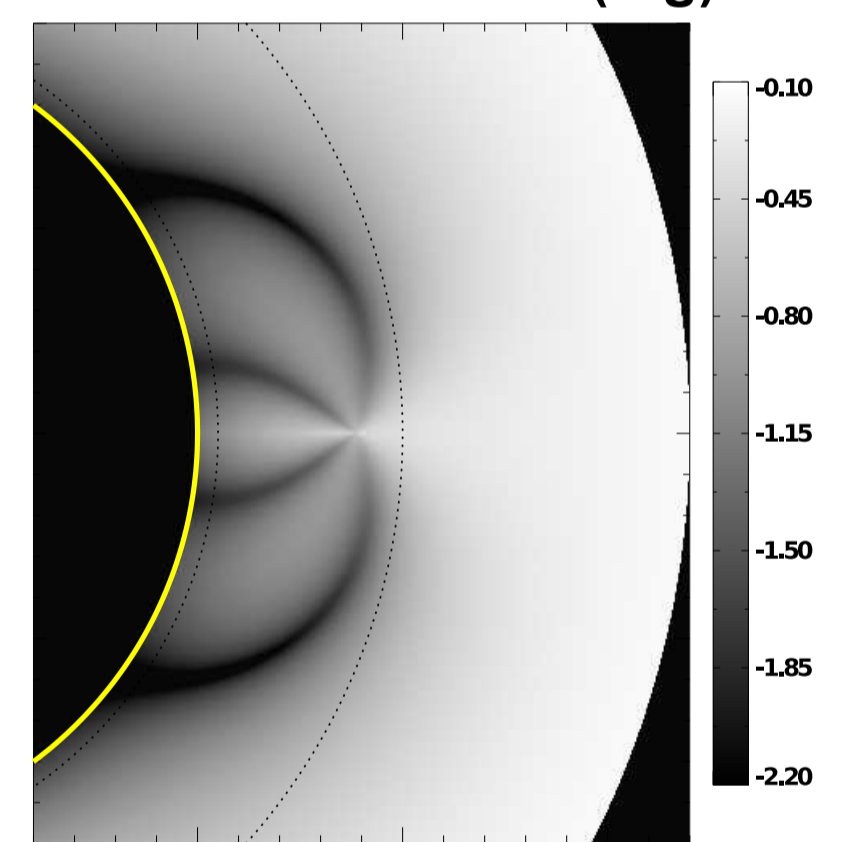
1. LOS magnetic field is zero
2. B is 54.7° from radial (Van Vleck inversion)
3. Anomalous LOS signal (due to LOS symmetry)

Double Streamer L/I (log)

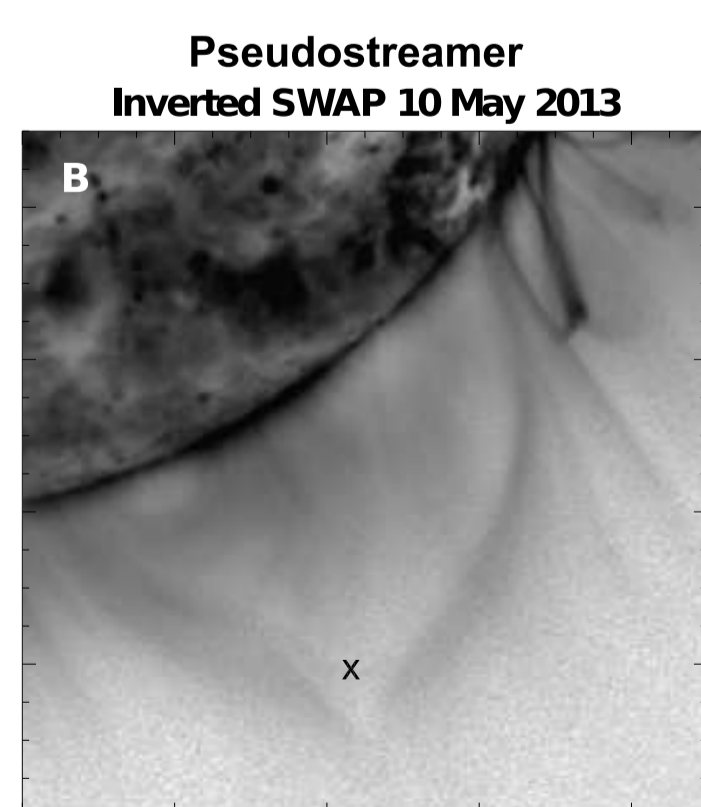
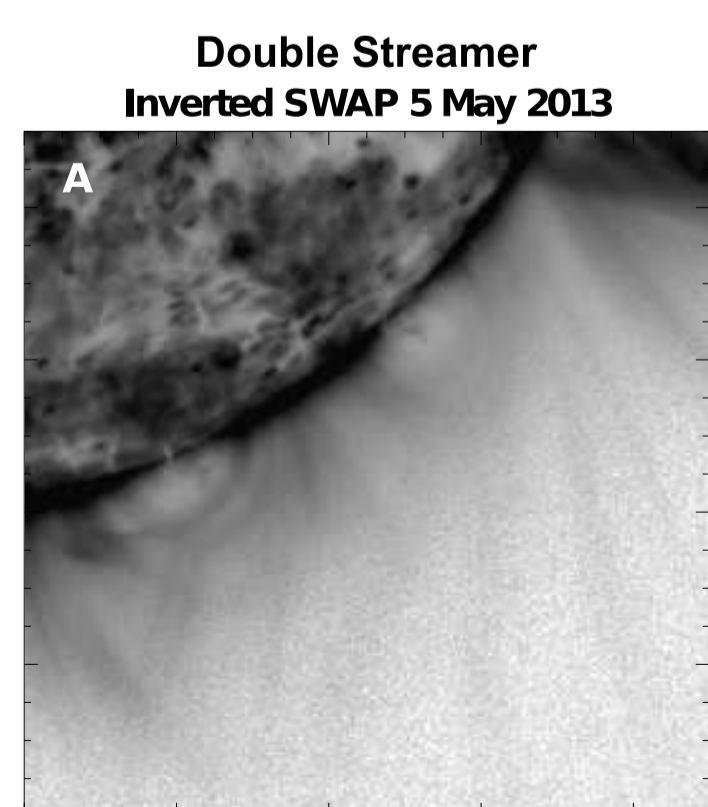


Double streamers have two pairs of Van Vleck inversions, which are usually roughly radial near the solar limb.

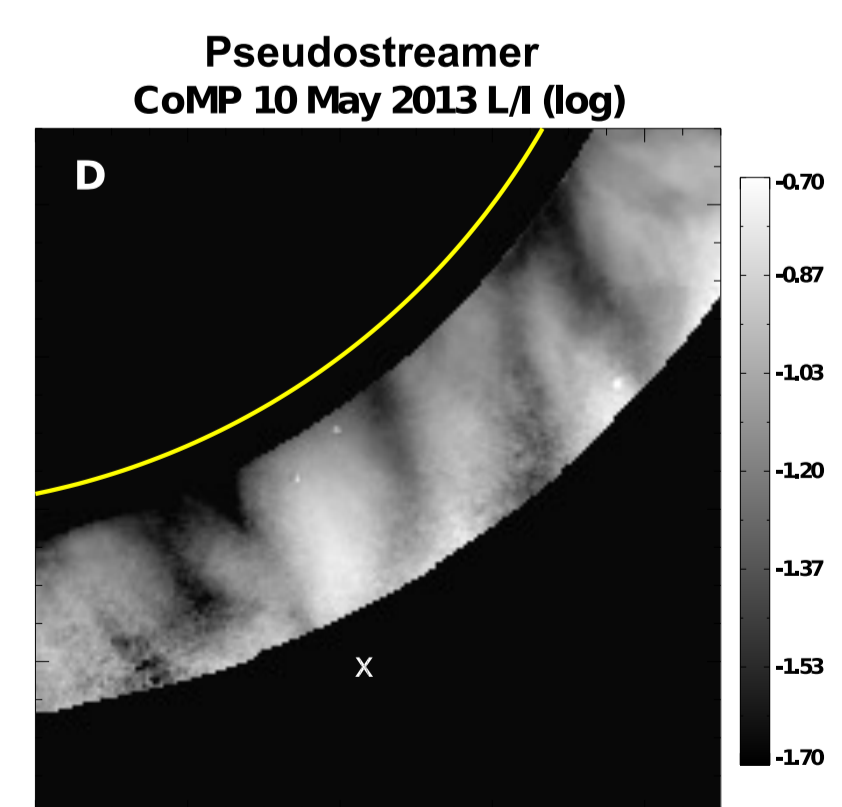
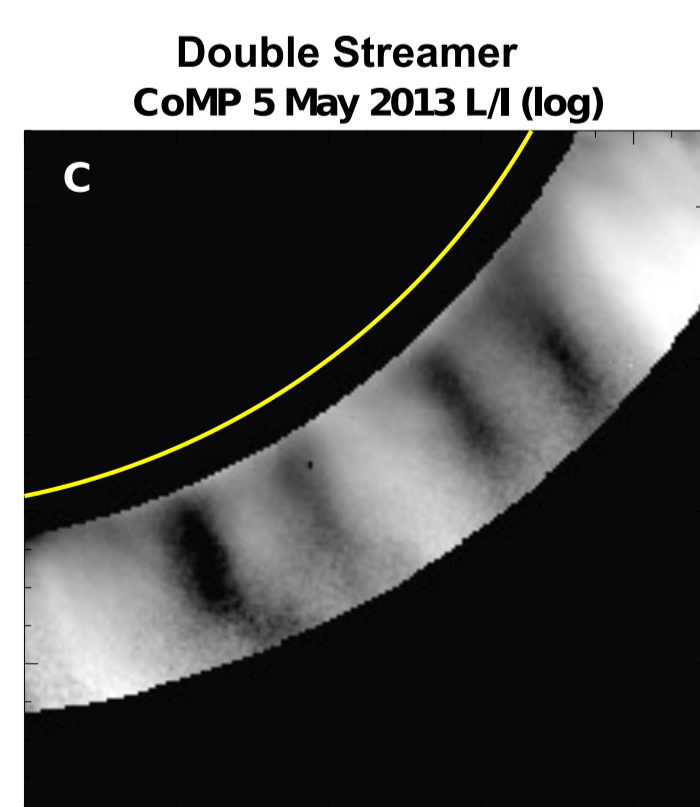
Pseudostreamer L/I (log)



Pseudostreamers also have two pairs of Van Vleck inversions, but they clearly come together at the null/separatrix location.



The SWAP images from May 5 appear to show a double streamer structure. The May 10 image looks convincingly like a pseudostreamer structure. However, it is difficult to tell the magnetic morphology of an observed structure from EUV observations alone.



The CoMP relative linear polarization images from May 5 clearly show two sets of parallel Van Vleck inversions, indicating a double streamer structure. On May 10, we see instead Van Vleck inversions that converge to a region near the 'x' outside the FOV, like in the forward modeled pseudostreamer morphology above.