

A Hybrid Double-streamer/Pseudostreamer

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

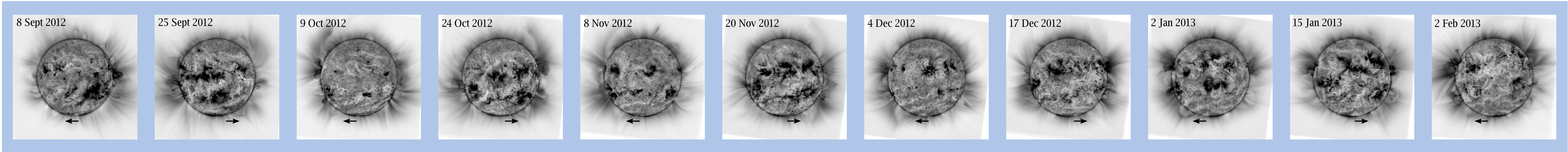
Royal Observatory of Belgium
rachmeler@oma.be

University of St.
Andrews, Scotland

Kiepenheuer-Institut für
Sonnenphysik, Germany

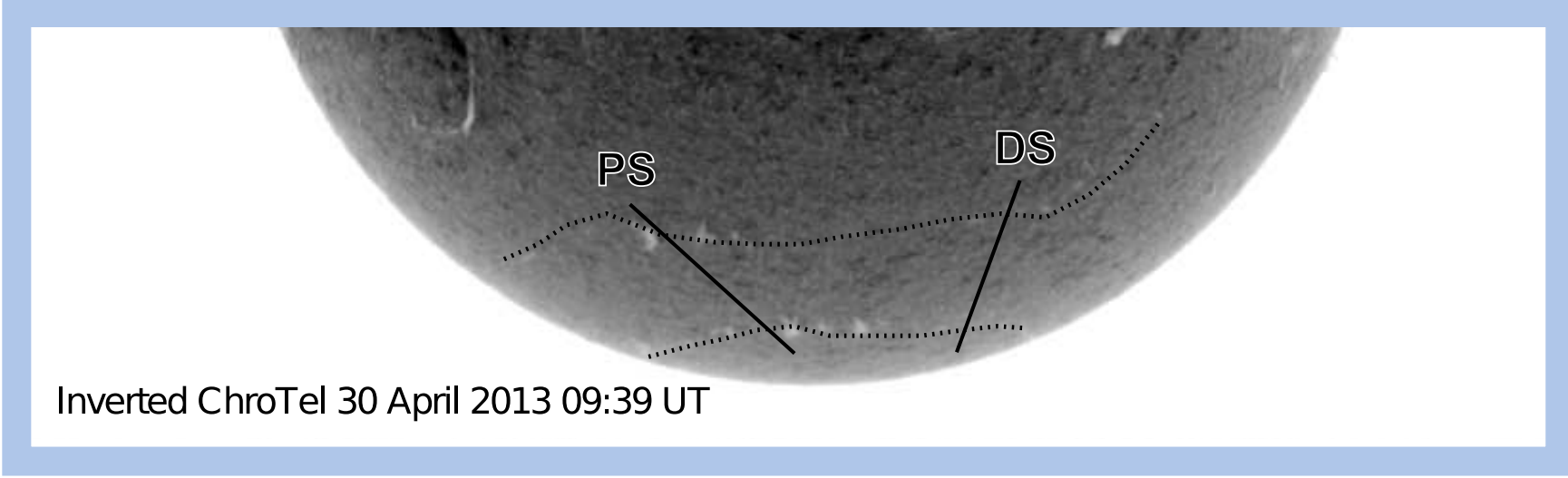
Royal Observatory
of Belgium

Durham University,
England



We saw an interesting magnetic structure rotate around the sun from about mid-2012 to mid-2013. One rotation of this relatively static structure was investigated in detail with multiple models and observations and found to be a hybrid structure that transitioned from a double streamer structure at one edge into a pseudostreamer at the other edge.

The H-alpha and EUV observations show that two filament channels run near the southern pole (dotted line on the left). PFSS extrapolations also show two continuous PILs with expanding arcades, consistent with a single structure that changes from a double streamer to a pseudostreamer along its length.



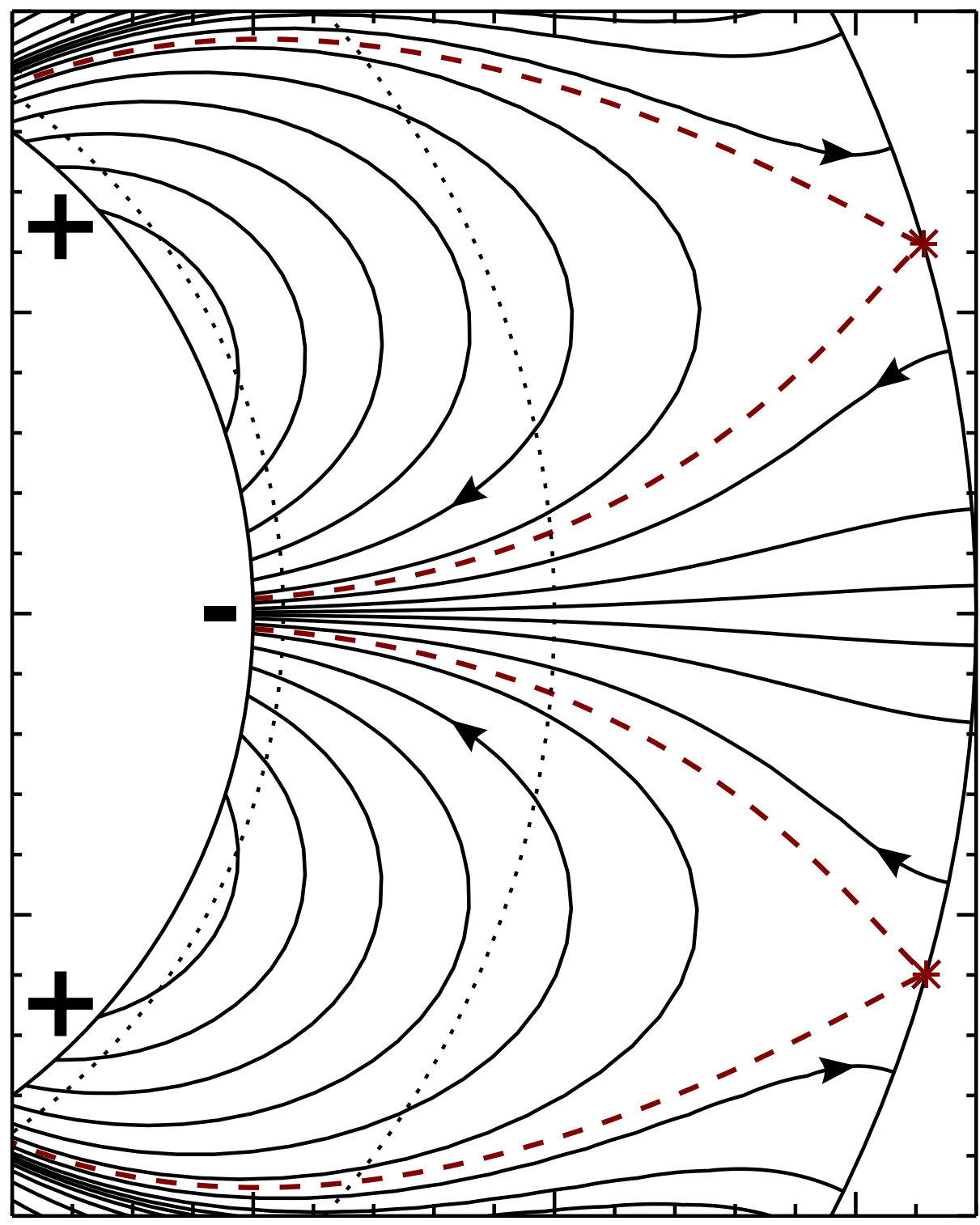
DOUBLE-STREAMER

Rachmeler, Platten, Bethge, Seaton, Yeates, *ApJ*, 2014.

PSEUDOSTREAMER

MODELS

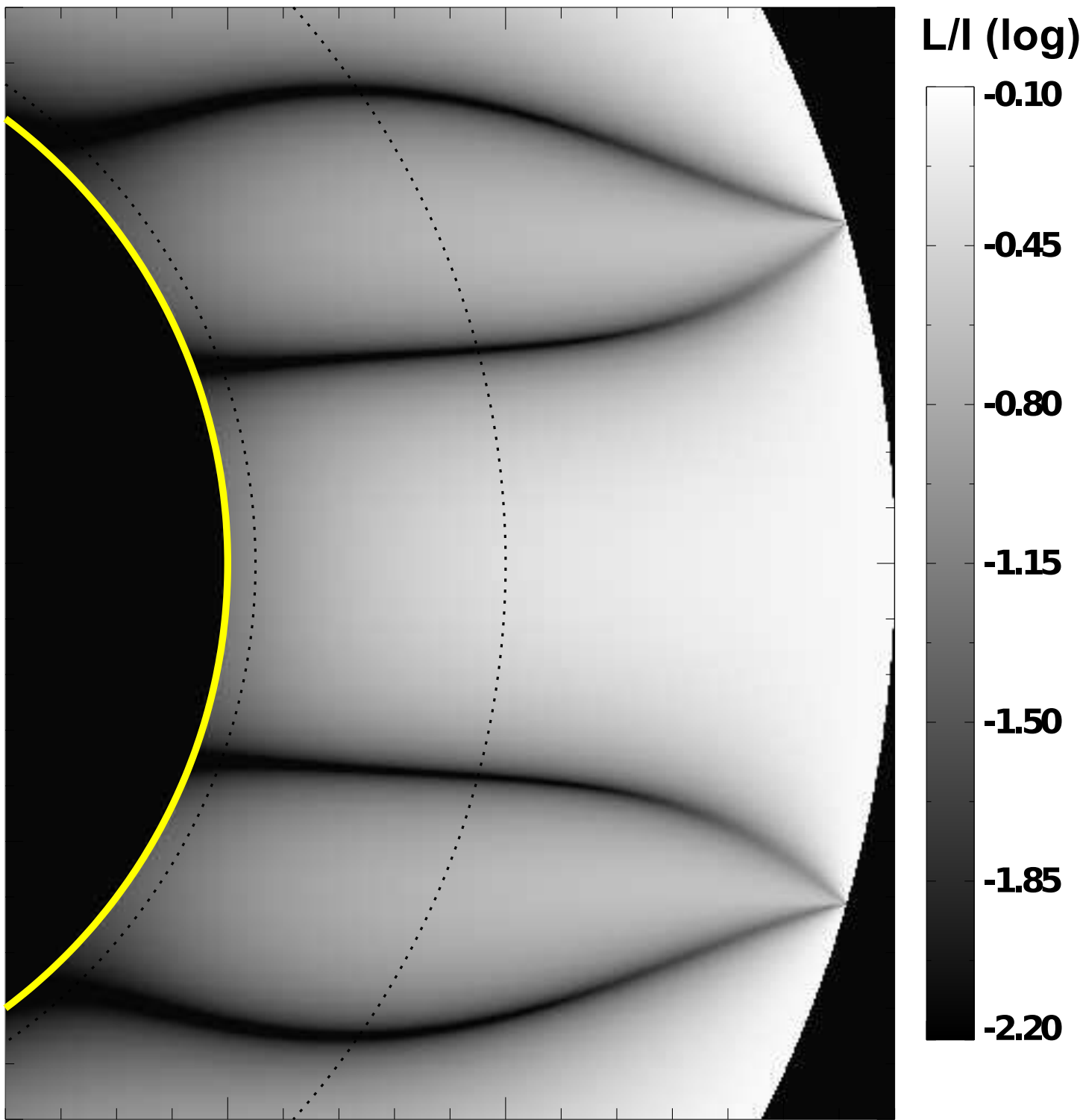
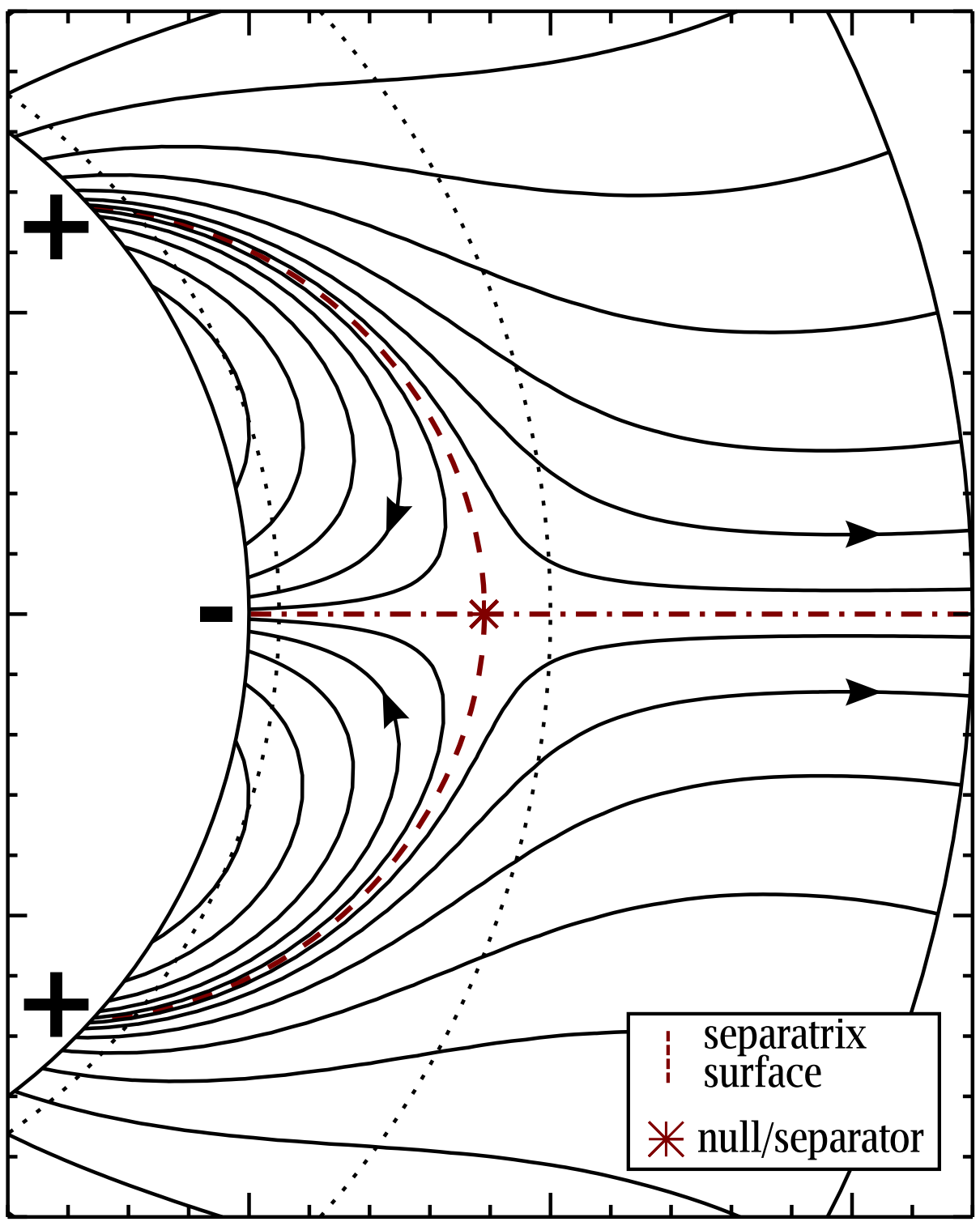
MODELS



We created simple axisymmetric and potential magnetic models of two morphologies, two streamers next to each other (left), and a pseudostreamer (right). They were created with PFSS extrapolation. Though similar, they have distinct topological features.

In a double-streamer, two streamers are separated by open field. Each streamer consists of closed arcade field under an extended plasma sheet that is also a current sheet.

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

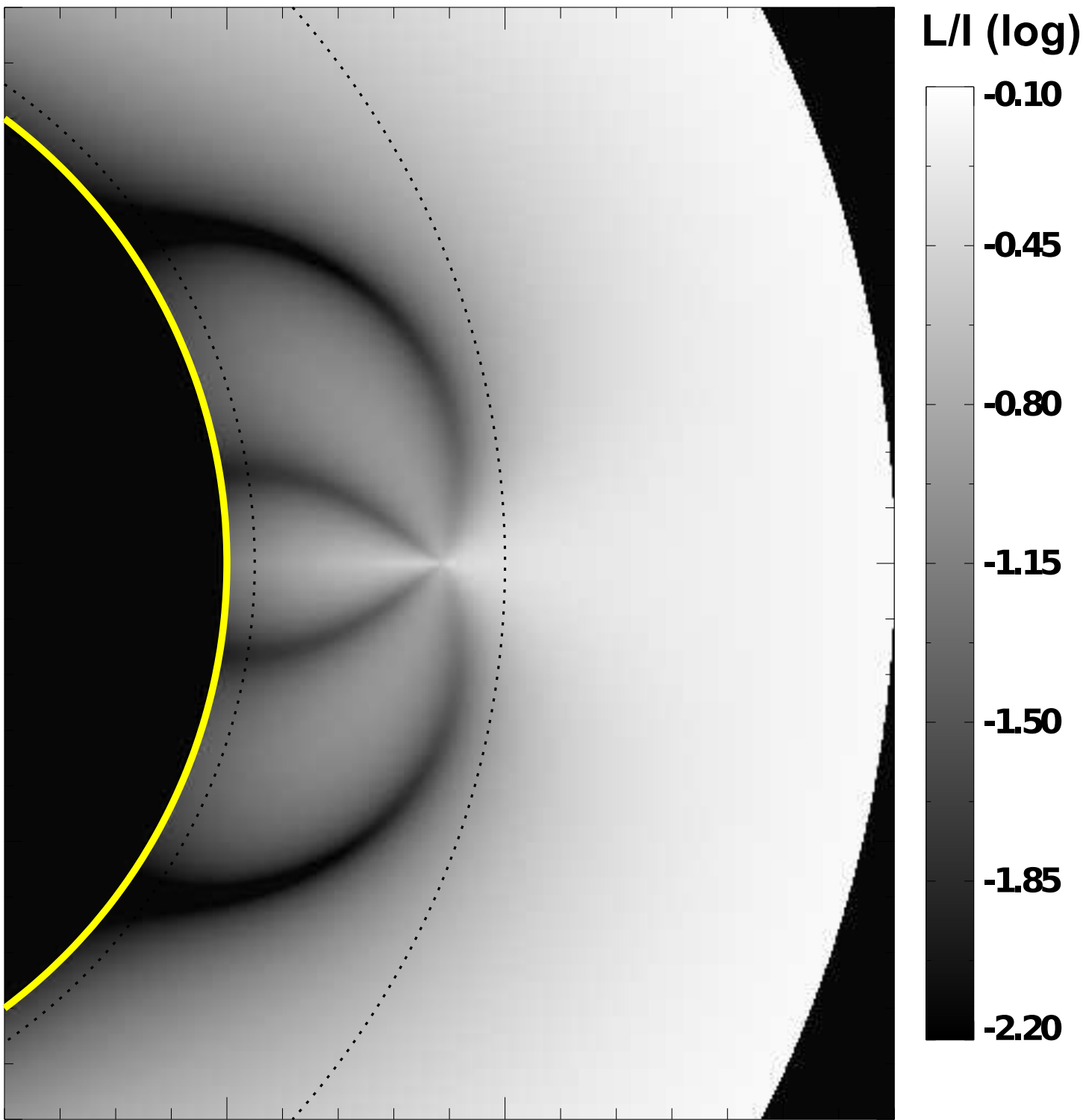


Coronal polarization is directly sensitive to the magnetic field. Relative linear polarization (L/I) at 1074.7 nm contains information about the direction of the field integrated along the LOS. Nulls in L occur when the magnetic field is along LOS and when the field is oriented 54.7° from radial (Van Vleck inversion).

Forward modeled L/I of the morphologies above show that each closed arcade produces two elongated Van Vleck inversion nulls. If the arcade lobes contain a flux rope or sheared field, there will also be a null signature between the inversions due to LOS field.

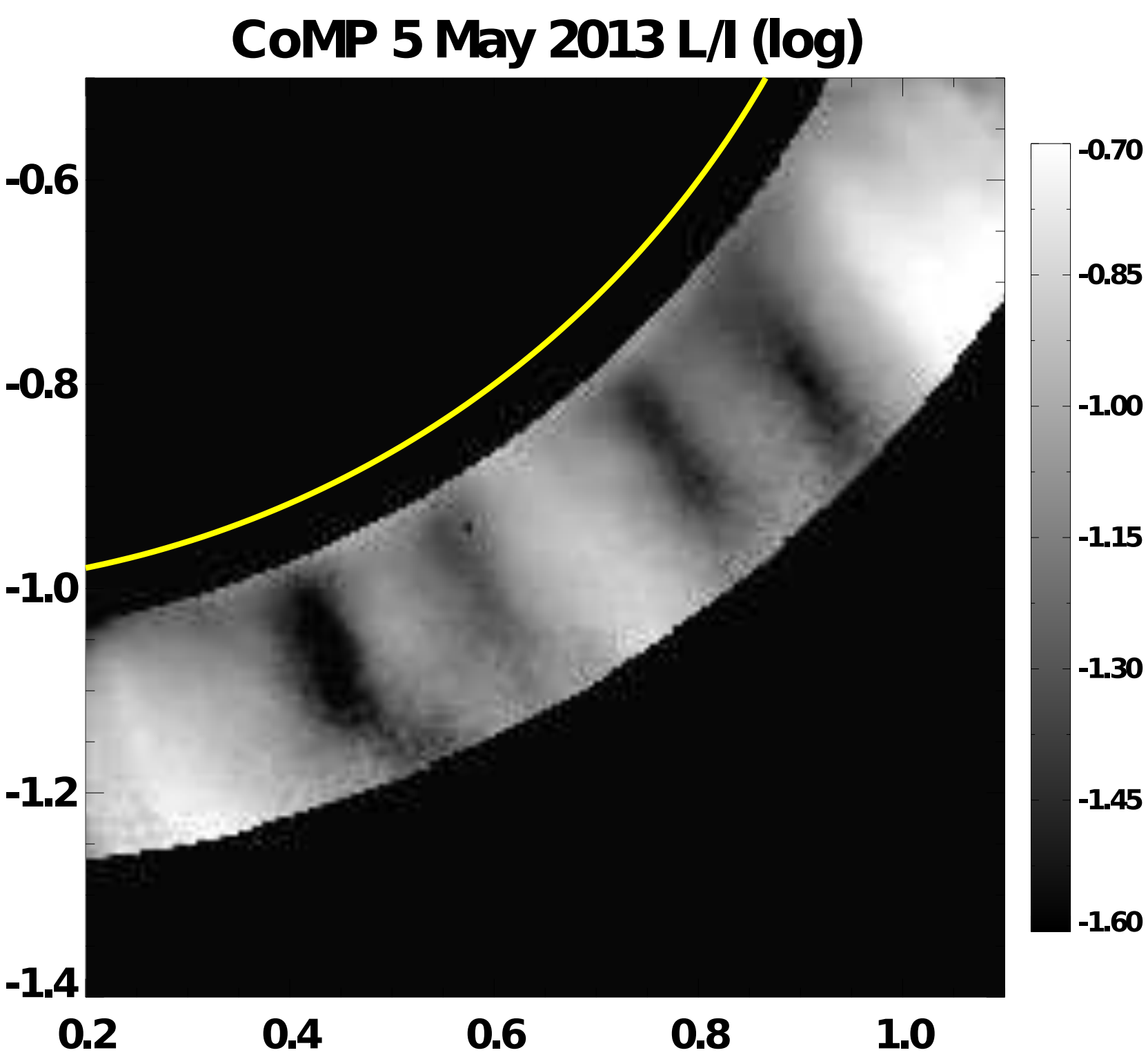
The Van Vleck inversions for a double-streamer are parallel to each other in the lower corona and may come together in the upper part of the streamer.

The Van Vleck inversions in a pseudostreamer morphology all come together at the null/separator and do not extend into the far corona.



OBSERVATIONS

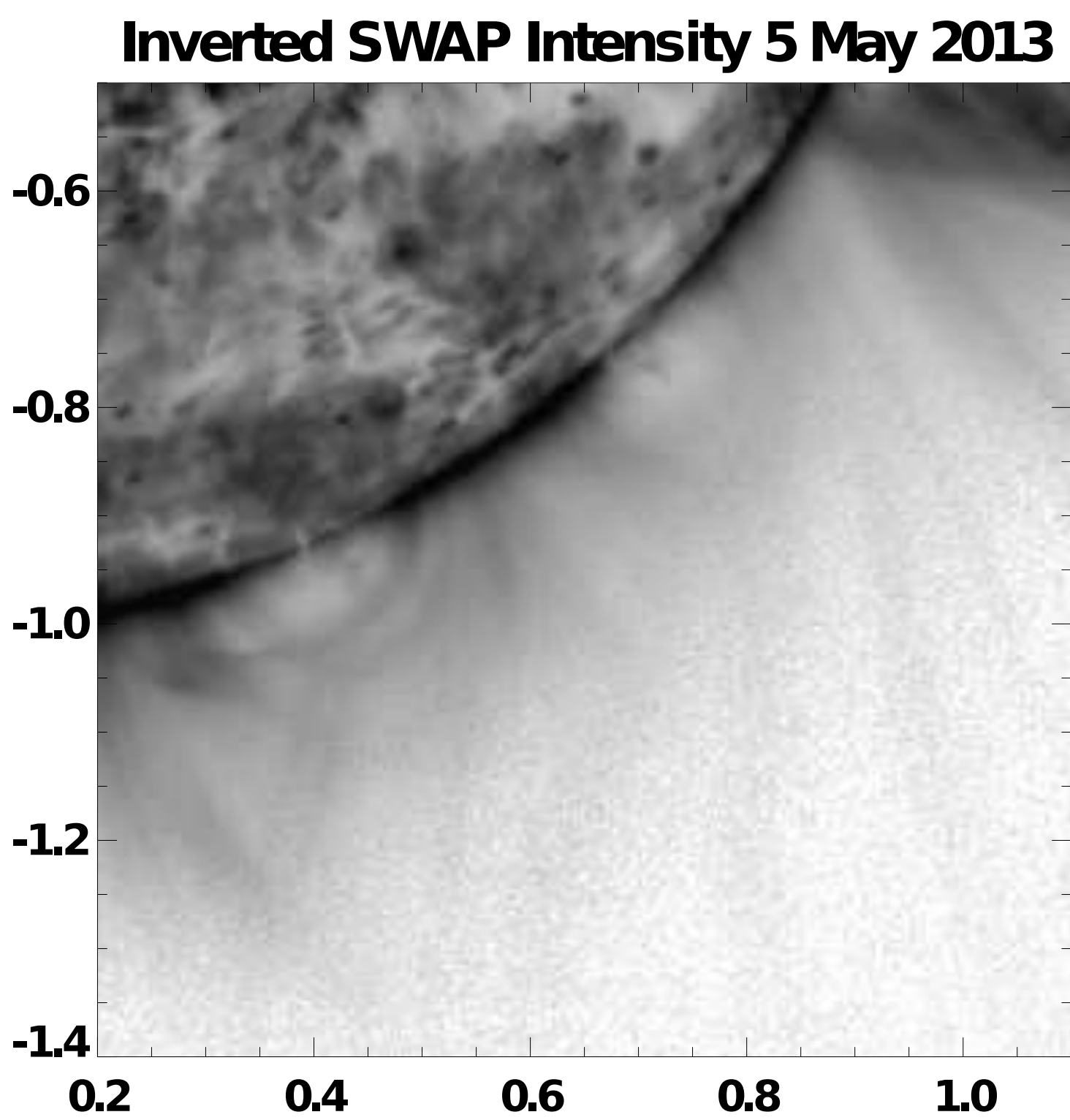
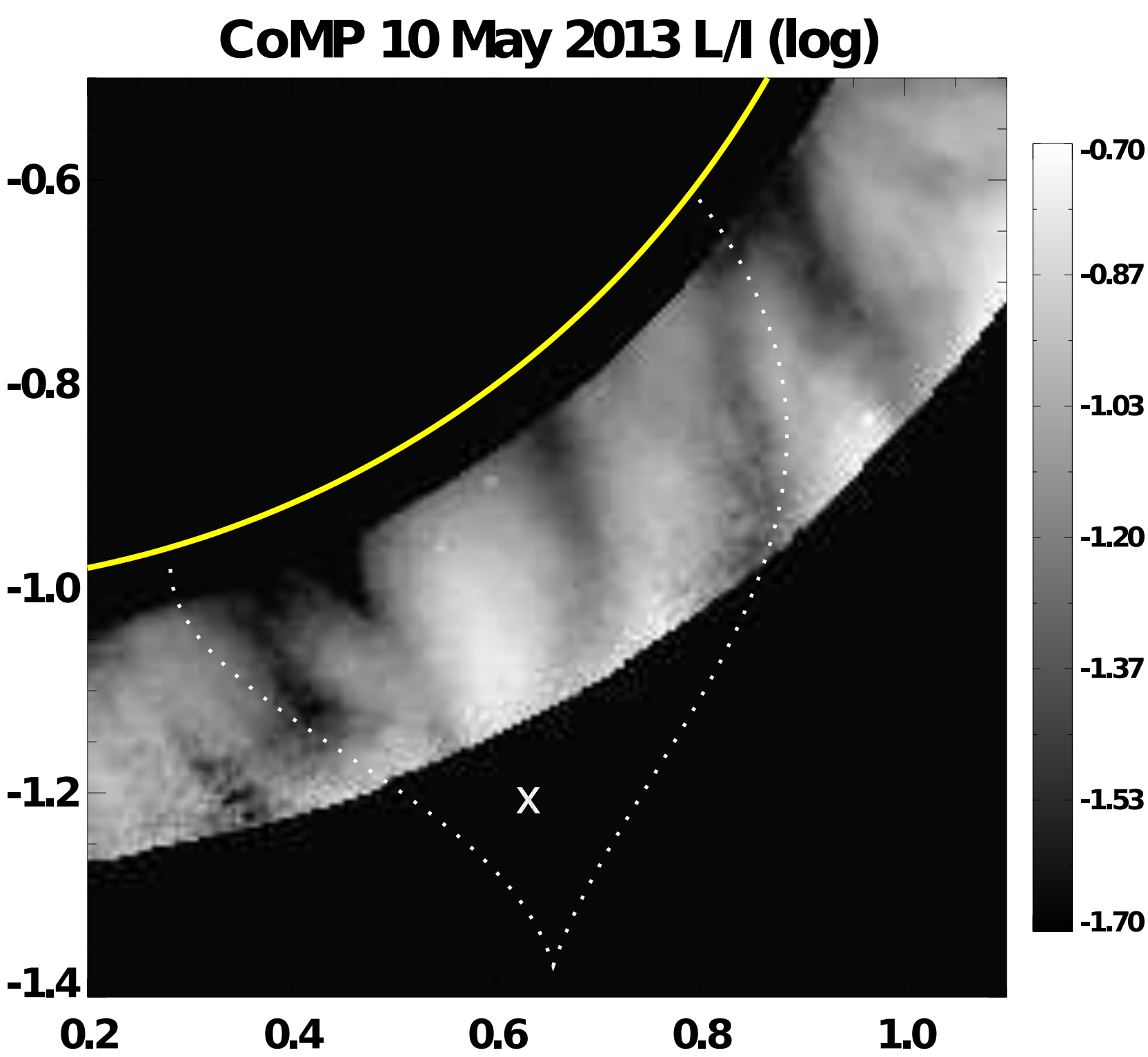
OBSERVATIONS



Observations of L/I from CoMP (Coronal Multichannel Polarimeter) in 1074.7 nm that were taken five days apart show characteristics of a double-streamer followed by a pseudostreamer.

The May 5 L/I observation is clearly indicative of a double streamer with two sets of parallel Van Vleck inversions that correspond to the two small cavity locations in the EUV observations.

The May 10 observation is consistent with a pseudostreamer whose null/separator ('x') is outside the CoMP field-of-view. Two sets of Van Vleck inversions converge near the pseudostreamer cusp.



The EUV (17.4 nm) observations of the structure taken with the SWAP instrument on the PROBA2 satellite correspond to the times of the CoMP images above. The intensity scale has been inverted.

The May 5 SWAP observations show two small separate cavities. No bright features clearly indicate open field between the cavities.

A pseudostreamer cusp is clearly visible in the SWAP observations on May 10. The movie shows that the cusp is present and stable before and after it rotates into the POS.

