

Contribution ID: 503

Type: Poster

Modeling the evolution of LOS magnetograms of emerging solar active regions.

Tuesday, 7 September 2021 10:05 (13 minutes)

The presence of elongated magnetic polarities in active-region (AR) line-of-sight (LOS) magnetograms indicates the existence of twist in the flux tubes forming them. These elongations, a.k.a. magnetic tongues, which are mostly visible during the emergence phase of ARs, determine the magnetic field distribution observed in LOS magnetograms, and therefore, affect the measurement of AR characteristics such as their tilt angles. Obtaining a good estimation of tilt angle evolutions and spatial variations plays a key role in constraining fluxtransport dynamo models, as Joy's law is fundamental for the formation and evolution of the polar field. In this work we aim to estimate the intrinsic geometrical properties of the twisted flux tubes, or flux ropes (FRs), that form ARs by comparing observed LOS magnetograms with synthetic magnetograms derived from a toroidal magnetic flux tube model. Analyzing a sequence of 66 magnetograms, corresponding to the emergence of NOAA AR 10268, we model the evolution of parameters such as the tilt angle, the length and cross-section size of the FR, and the emergence rate assuming a kinematic rise of the torus. Our method uses a probabilistic scheme based on the Bayes theorem to infer the most probable intrinsic parameters of the emerging flux tube, assuming a normal distribution for the differences between the model and the observations. We discuss the importance of the prior distribution for all the model parameters in order to avoid degeneracies of the optimal solution. We also propose a recursive method to constrain these priors directly from the observations.

Primary authors: POISSON, Mariano (Instituto de Astronomía y Física del Espaco (IAFE-UBA-CONICET)); Dr GRINGS, Francisco (Instituto de Astronomía y Física del Espacio (IAFE)); Dr LÓPEZ FUENTES, Marcelo (Instituto de Astronomía y Física del Espacio (UBA-CONICET)); Dr MANDRINI, Cristina H. (Instituto de Astronomía y Física del Espacio (UBA-CONICET)); Dr DEMOULIN, Pascal (LESIA)

Presenter: POISSON, Mariano (Instituto de Astronomía y Física del Espaco (IAFE-UBA-CONICET))

Session Classification: Poster Session 3.1

Track Classification: Session 1 - Solar Interior, Dynamo, Large-Scale Flows and the Solar Cycle