Geophysical Research Abstracts
Vol. 17, EGU2015-10832-1, 2015
EGU General Assembly 2015

Improving solar 11yr magnetic cycle prediction by using variational data assimilation in a mean field dynamo model

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We present our recent effort to implement modern variational data assimilation techniques into a 2.5 D mean field solar dynamo code. This work extend the work of (Jouve et al. 2011, ApJ) to take into account the correct spherical geometry and meridional circulation into so-called Babccok-Leigthon flux transport dynamo models. Based on twin-experiments, in which we observe our dynamo simulations, and on a well defined cost function using toroidal and poloidal field observations we are able to recover the main attributes of the dynamo solution used to test our data assimilation algorithm. By assimilating solar data (such as Wolf number
or butterfly diagram) we are starting to deduce the profile and temporal variations of key ingredients of the solar dynamo. We find that the data sampling and the temporal window are key to get reliable results. We show how such powerful technique can be used to improve our ability to predict the solar magnetic activity.
This work is supported by Idex Sorbonne Paris Cite via the DAMSE project.