M14c Dynamo action during grand minima

J.A. Abreu(EAWAG)、○磯部洋明 (京都大学)、A. Ferriz-Mas (Vigo 大学)、J. Beer（EAWAG）

The sunspot record since 1610 shows cycles of magnetic activity with an irregular distribution of amplitudes and with a period around 11 years; they are modulated on longer timescales and were interrupted by the Maunder minimum in the 17th century.One has traditionally associated "magnetic activity" with "number of sunspots", but recent data analysis of cosmogenic isotopes by Abreu et al. (2009) confirm that the solar magnetic activity did not disappear during the Maunder minimum and previous "grand minima"; i.e., it is wrong to identify "grand minima" with lack of dynamo action. Actually, the magnetic field in the photospheric layers of the Sun is distributed in a very inhomogeneous way, with sunspots being the most relevant manifestation of magnetic iactivity at the solar surface, but not the only one.Based on purely theoretical arguments, Schmitt et al. (1996 and later papers) suggested a scenario of two spatially separated but interacting dynamos in the Sun: (i) A turbulent weak-field dynamo (i.e., with field strengths well below equipartition) operating throughout the convection zone and (ii) a strong-field dynamo operationg in the overshoot layer at the bottom of the convection zone operating with super-equipartition fields.How the "strong-field dynamo", responsible for the activity cycle of bipolar active regions would operate has been simulated in a number of later papers. In this contribution we aim to understand the operation of the turbulent weak-field dynamo in a simplified setting. The convective collapse plays a role in the context of the local dynamo.