Model cycles 23 and 24 using mean field dynamo

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We model the physical parameters of the solar cycles 23 and 24 using the nonlinear 3D mean-field dynamo model and the solar data on the bipolar magnetic regions (BMR). Our results show that the surface magnetic activity can provide substantial part of the dynamo budget in the studied solar cycles. We find that the average effect of the emerging bipolar magnetic regions tends to increase the Lorentz force of the large-scale axisymmetric magnetic fields. The BMR activity results to acceleration of the equatorward part of the magnetic activity belt and deceleration of the poleward parts. Fluctuations of the BMR's tilt affect the global parity breaking, asymmetry of the large-scale flow variations and the meridional circulation cross flows between the solar hemispheres.