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Magnetospheric Driving of Saturn's Thermosphere during Storm-Like Events

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We present results of numerical experiments, using the UCL axisymmetric model of Saturn's thermosphere, (Smith et al., Ann. Geo., 2005) which reveal the following aspects of thermospheric flow during transient changes in the polar cap boundary and magnetospheric angular velocity:
1. The enormous inertia of the thermosphere introduces a delay of order one planetary day between the peak magnetospheric and peak thermospheric angular velocities.
2. This delay results in a period where thermospheric rotation exceeds magnetospheric, and the corresponding field-aligned currents transfer angular momentum from the magnetosphere to atmosphere, rather than the reverse situation which pertains in the steady state.
3. The thermospheric inertia also leads to flow speeds significantly more rapid (>10%) than the steady state, up to several planetary days after storm subsidence.
A rich variety of auroral signatures are predicted by the modelling, including multiple auroral arcs in the vicinity of the quiescent oval.