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Large-Scale Convection and the Solar Activity Cycle HERSCHEL SNODGRASS, Lewis & Clark College — In 1980 B. J. LaBonte and R. F. Howard discovered a weak modulation in the differential-rotation of the Sun. As seen in the Mount Wilson Doppler-shift data, it appears as a zone of enhanced shear, first emerging at high latitudes toward the end of a sunspot cycle, then migrating toward the equator on a trajectory that becomes the median of the sunspot zone of the next cycle, and vanishing with that cycle. This pattern is known as the torsional oscillation, but subsequent study has it neither a torsion nor an oscillation. It is surely connected to the cycle, and its presence a few years prior to the emergence of the next-cycle sunspots suggests that it may prove predictive of the activity to come. A 1987 model considered it as the surface signature of a large-scale convective downdraft, created by the magnetic shadow of a deep azimuthal magnetic field, which in turn localizes and enhances this field. Recent work notes that the assumption of approximate azimuthal symmetry is unjustified owing to the averaging that must be done to uncover it, and suggests that it may instead represent the azimuthal average of large-scale vortices associated with active regions.

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