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Magnetic island evolution in sheared flows for stellarator fields.[1]
JULIO MARTINELL, Instituto de Ciencias Nucleares, UNAM, DANIEL LOPEZ-BRUNA, Laboratorio Nacional de Fusion, CIEMAT — It has been evidenced that the magnetic islands associated to low-order rational magnetic surfaces in stellarators play an important role in the dynamics and transport properties. In particular, in the TJ-II heliac there is clear evidence of the appearance of transport barriers near the position of rational surfaces that may lead to an L-H transition or to an oscillatory behavior. Low-frequency magnetic activity has also been detected, that indicates variations in the properties of the magnetic islands. In order to explain the observations, we study the evolution of magnetic islands in the 3D geometry of stellarators starting from the vacuum islands due to error fields. The nonlinear equation for the island width is considered with the inclusion of the polarization current which depends on the EXB velocity profiles around the island; this has a destabilizing contribution. Additionally, the electromagnetic torque acting on the islands produced by the currents in the rational surface are computed, which turns out to be proportional to the island width. The results indicate that shear flow produces island growth and when a given width is exceeded the torque gives rise to island rotation in the frame where E=0. This leads to reduction of the flow shear and transport barrier vanishing.

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