Studies of the effects of plasma shape on the edge localized modes using the 
BOUT++ code

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It is known that the plasma shape has strong effect on the MHD instabilities, including the edge localized modes (ELMs) [1]. Using the TEQ equilibrium module in the CORSICA code, a series of equilibria are constructed, which have different pedestal height and edge current and different triangularity (including the negative triangularity). For those equilibria, the edge stability is calculated by the BOUT++ code [2]. For the ideal MHD stability, the BOUT++ is benchmarked with the GATO and ELITE codes. It is shown that without the edge current, the modes are dominated by the high-n ballooning modes, and plasma shape has weak effects on it. While with the edge current, the plasma shape has strong effects on the edge stability. For medium-n and high-n modes, positive triangularity has strong stabilization effects, then the modes are dominated by the peeling-ballooning modes; while negative triangularity has strong destabilization effects, then the modes are dominated by the high-n ballooning modes. Using the BOUT++ code, the effects of the plasma shape on the non-ideal effects (diamagnetic and resistivity) also are calculated.