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Integrated core-edge tokamak simulations using a novel coordinate system for divertor detachment and heat-load studies[1] JARROD LEDDY, BEN DUDSON, University of York, MICHELE ROMANELLI, Culham Centre for Fusion Energy — Simulating tokamak edge plasmas can often be difficult due to the X-point and divertor region having a different geometry than the rest of the plasma. For edge simulations, a field-aligned coordinate system is normally utilized so that the elongated structures along the field line can be resolved using less grid points while maintaining high resolution perpendicular to the field line. This introduces a singularity at the X-point and constrains the radial coordinate and the poloidal projection of the field-aligned coordinate to be orthogonal. We propose a new coordinate system that relaxes this constraint to allow arbitrary geometries to be matched in the poloidal plane while maintaining a field-aligned coordinate. This is useful at the divertor plate where field lines are not perpendicular to the surface and at the X-point where a close approach is desired. We implement a collisional two-fluid turbulence model using BOUT++ [1] to simulate an isolated divertor leg and investigate the effect of divertor plate angle on detachment and heat loads. We then couple edge simulations in BOUT++ with CENTORI [2], a core plasma fluid code, to study the evolution of the full plasma with these improved boundary conditions.

[1] B. Dudson, *et al*, Comp Phys Comm, 9 (2009) 180.
[2] P. Knight, *et al*, Comp Phys Comm, 11 (2012) 183.

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