The 2D fluid code to study edge plasma of spherical tokamak (TS-6, DIII-D, MAST and etc) has been developed. This fluid transport model contains impressive features like complex magnetic geometry, multi-spices radiation and impurity, natural transport transport and source and wall sputtering/recycling. Along with these features which can be found in other fluid models like UEDGE, this code contains turbulent radial transport features which are quite critical features in fusion technology.

Physical features of this code include multi-spices density, velocity and temperature, vector and scalar potential fluxes radial turbulent mode, recycling/recombination and Navier-Stokes model for wall recycled/sputtered neutrons. From the other side, different numerical techniques have been used as Newton implicit solver, steady state/time dependent and finite volume method. It should be mentioned that this method has been written in C language while using PYTHON/Jupyter notebook to run the examples.

There are two external models providing necessary parameters for plasma edge code. First, exact solution of grad-shafranov equation code that calculates equilibrium parameters necessary to determine edge turbulence, and turbulence code able to calculate parameters fluctuation in local regions.

The model has been tested for device geometry and plasma parameters of two devices, Tokyo University Spheromak and Mega Ampere Spheromak (MAST), then results have been compared with values obtained from UEDGE code. Comparison between two codes shows good correlation beside the ability of new model to catch radial turbulence.

Results show that radial neutral flux basically dominate across separatrix in TS-6 device for the Hydrogen and Argon gases.

Regarding edge transport modes for Ar gas, ExB drift shows critical role, while for Hydrogen the grad B drift became dominant in plasma transport to the core.

Study of turbulence is an outer region showed that for ions, strong eddies are responsible for transport while ion scale turbulence is suppressed because of high beta regime. On the other side, electrons have high temperature and radiation near the wall while the trapped electrons are mainly responsible for turbulence not only locally but also globally which needs to be studied further by global kinetic/fluid model.