



ETS5 features that could be useful for ETS6

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- Hyperdiffusion
- Internal boundary conditions
- +pedestal predictions

Hyperdiffusion



Reason for implementation in ETS5:

improve numerical stability of the density, temperature equations

Implementation in ETS5:

diffusion term that is added to the left hand side of the transport equation:-

$$(D_{\text{hyper}}+D)*n'(i)+(v_{\text{conv}}+D_{\text{hyper}}*n'(i-1)/n(i-1))n(i)$$

Pros:

- simple to implement
- helps to keep time step at the reasonable values

Cons:

does not work for some cases (sharp gradients)

Status in ETS5:

implemented and tested, used in 'everyday' simulations

Possible implementation in ETS6:

- use as is in ETS5
- add source term
- include hyperdiffusion directly in the solver (each solver will have slightly different implementation)

Internal Boundary conditions



Reason for implementation:

‘remove’ edge region where transport models does not provide ‘reasonable’ results

Implementation in ETS5:

cut the region taking into account in the solver

Pros:

simple in implementation

Cons:

what happens in the ‘cutting’ surface? to be tested

Status in ETS5:

new development, to be tested

Possible implementation in ETS6

to be discussed



Reason to implement in ETS5:

to have realistic predictions for the dynamically changed pedestal values (T,n) and profiles in the 'edge' region (pedestal top - LCFS)

Implementation in ETS5:

only first part is implemented that calculated values for pedestal T,n and updating boundary conditions

Pros:

Cons:

Status in ETS5:

New development, to be tested

Possible implementation in ETS6:

to be decided