Overview of Validation Efforts

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Methodology:
- list major edge codes - find original ref(s) to code
- divide into areas
- perform literature search
- tabulate the following:
  - # of citations to original code ref(s)
  - # hits on code descriptor via scholar.google, e.g. "B2" "transport" "code"
  - # citations (INSPEC) with descriptor in subject/title/abstract

Apologies to Plasma-Materials-Interaction codes: not done
# citations to original code ref(s)
# hits on code descriptor via scholar.google
# citations with descriptor in subject/title/abstract

2D fluid codes
ELM/MHD codes
H-mode pedestal codes

Code
# of citations to original code ref(s)
# hits on code descriptor via scholar.google
# citations with descriptor in subject/title/abstract

Integrative edge models

Codes modelling neutrals

<table>
<thead>
<tr>
<th>Code</th>
<th>A*</th>
<th>B*</th>
<th>C*</th>
<th>A''''</th>
<th>B''''</th>
<th>C''''</th>
<th>D'''''</th>
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Code

- A*
- B*
- C*
- A''''
- B''''
- C''''
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**Edge/SOL turbulence codes**

**Atomic/Molecular CR codes**
UEDGE validation against DIII-D diagnostic measurements is state-of-the-art worldwide

- **UEDGE reproduces many detailed edge measurements on DIII-D**
  - A large variety of diagnostics, including upstream radial density and temperature profiles using simple radial transport model [Porter PoP 2000]
  - Divertor outer leg plasma profiles in both attached and detached modes when full impurity physics is included [Fenstermacher PoP 1997]
  - Very low Te (order 1 eV) seen in detached plasma, and concomitant strong 3 body recombination when ion/neutral momentum transfer is included [Fenstermacher PoP 1997, Fenstermacher PPCF 1999]
  - 2D profiles of line emission of both fuel and impurity species when full impurity model and the effect of plasma drifts are included [Groth JNM 2005, IAEA04 and EPS05 - NF to be submitted]
  - Up/Down asymmetry of power and particle flow for unbalanced DN plasmas when effect of drifts is included [Porter IAEA02, Rensink Contrib. Plas. Phys. 2002]
UEDGE shot simulations identify areas requiring more data to complete model validation

- Uncertainties in some parameters limit use as a predictive tool
  - Scaling of simple radial transport model is not known so need to use theory based models
    - BOUT / UEDGE coupling in progress
  - Uncertainty in effects of wall conditioning introduce uncertainty in simulations of divertor recycling effects
    [Groth JNM 2005, IAEA04, EPS05 - NF to be submitted]
    - Need better measurements to validate models
  - Uncertainty in chemical sputtering effects introduce uncertainty in impurity source distributions
    [Groth APS05]
    - Need better measurements to validate models
  - Simulated SOL deuterium flow patterns do not reproduce magnitude of Mach probe measurements, although poloidal variation is qualitatively consistent with measurement
    [Asakura NF 2004, Groth JNM 2005]