What are the 3 most important scientific accomplishments you have made that impact predictive capability. How have they been validated against experiment.

• Our focus to date has been on developing the computational framework and infrastructure in order to make scientific accomplishments in the future and not on doing [plasma] science

• However, we have made some initial coupled TSC / TRANSP (NUBEAM) runs that represent a new, unique capability in ITER simulation

– These have been presented at ITPA meetings and are considered state-of-the-art

– Now being extended to included TORIC

– Experimental validation is ongoing

List up to 3 key contributions CSET contributors have made to our project.

- Solver technology from TOPS
  - All the extended MHD codes use the TOPS solvers
  - TOPS played a large role in improving efficiency of AORSA
- CCA technology and approach from TASCS (formerly CCTTSS).
  - Close relation with this group / overlap in personnel
- ITAPS tools on data transfer
  - in parallel between different meshes and different discretizations,
  - maintaining conservation and other required physical properties.

What was the science enabled by using the max # of processors that you used. What was that number and what was the code efficiency ?

- SWIM is making use of the codes developed in CEMM and CPES
  - See those presentations regarding component code performance

How is your approach going to work with the future FSP? Are the 3 FII's talking to each other?

- If the SWIM approach is judged to be the most appropriate, it could become the one that the FSP adopts

- In any case, the SWIM component approach has emphasized decoupling and clearly defined interfaces, in part to be able to easily fit in with other frameworks.

- All of the PI's on the three projects are on each other's mailing lists and have access to repositories.

- Other interactions:
  - Indiana U. CS student from SWIM is at Tech-X (FACETS) working on the job harness system for SWIM.
  - Klasky (CPES) and Bramley (SWIM) are collaborating on fast file transfers and workflow systems.
  - Bramley(SWIM) is working with Sveta(FACETS) on a TASCS project that both groups plan to utilize.
  - TOPS is in common to SWIM (Keyes), CPES (Adams),and FACETS (McInnes)

What are plans for code verification and validation?

- Interchangeability of components and central “plasma state” file greatly facilitates both verification and validation
  - Individual code components can be swapped in and out for verification studies, for example AORSA and TORIC
  - Plasma state can be created from simulation data or experimental data for validation studies
- Major SWIM goal is to calculate RF stabilization/destabilization of sawtooth and neoclassical tearing mode
  - Experimental data from D-IIID and JET has been identified and referenced and validation will begin once simulation results become available
- Have recognized need for unit testing and have started developing the information needed to implement it for SWIM components.
- Regression testing is in a similar state.

What are the top 2 deliverables for next year and the following years?

Next year:

- Have IPS running on both MHD and Jaguar
  - With state-of-the art capabilities and regular users
  - Contributing to conference presentations, ITPA, journal articles

- Have begun a meaningful study of RF effects on sawtooth behavior.
  - Start with linear stability, extend to nonlinear

In 3 years:

- Have reached physics conclusions in RF/sawtooth study
  - Journal article and/or major conference presentation

- Have begun a meaningful study of RF stabilization of Neoclassical Tearing Modes (NTM)
  - Consensus reached on physics of closures in the presence of RF
  - Direct 2-way coupling demonstrated between 3D MHD code(s) and RF code(s)