Fluid Closures Workshop

Welcome to Oak Ridge National Lab

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Goal:
Chart a course towards developing a predictive computational model to describe the macroscopic dynamics of burning plasmas.

Develop analytic and numerical methodologies for incorporating needed kinetic, source (RF and beams) and microturbulence effects in fluid moment, MHD-type plasma descriptions

So how do we go about charting such a course?

- **Have a broad discussion of different ideas and issues on fluid closure (This is certainly the crowd to do it)**

- **Consider the specific needs for analysis like this:**
  - **We have projects with fairly urgent needs – CEMM, SWIM**
  - **We should also look to the requirements posed by the different phenomena of interest. What specifically do we have to do to advance the understanding of: sawtooth oscillations, neoclassical tearing modes, resistive wall modes, ELMs, fishbones …**

    There is commonality but the requirements are likely different

- **Identify what might be possible on the time scale of a few years (the horizon of the SciDAC projects), and on a longer time scale (> 10 years)**

- **Write it all down (stay and contribute to the wrap-up discussions on Friday)**

We are interested in development for the long term (> 10 yr). So think broadly. But:

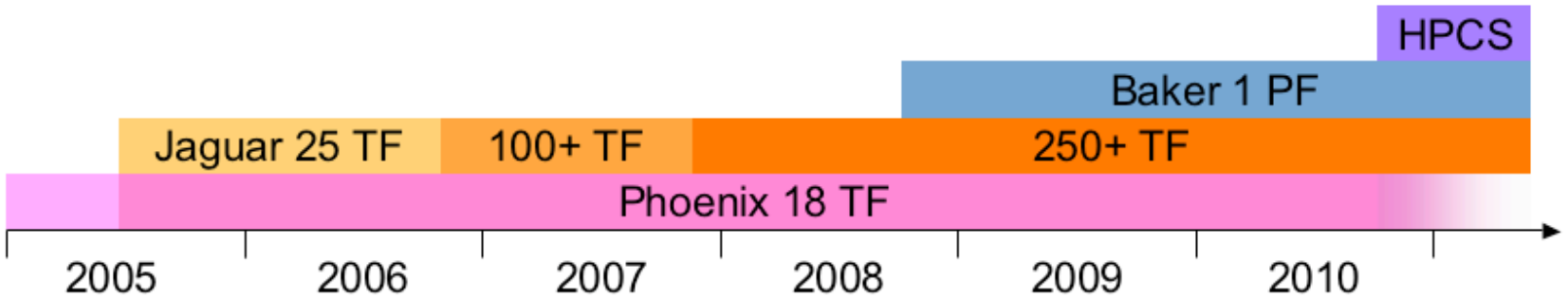
- We have on-going computational projects (CEMM and SWIM) that need near term, incremental improvements. Think about the characteristics of the existing codes and about interim approaches that can be used with them

- In the SWIM project we want not only to understand and predict macro-stability, but also to learn how to control it:
  - Need to include effects of sources (RF, beams) in the closure
  - Distributions may not be near-Maxwellian

Big computers are here – more are coming. We should also take a broad view of what is computable

Leadership Computing Facility Schedule for 1 Petaflop

- Deploy sustained-PF Cray Cascade system 2010
- Deploy 1 PF Cray "Baker" late 2008
- Upgrade Jaguar to 250+ TF late 2007
- Upgrade Jaguar to 100+ TF late 2006
- 18 TF Cray X1E (Phoenix) and 25 TF Cray XT3 (Jaguar) currently in production



- **The trend is toward greatly increased numbers of processors (10,000 – 100,000) soon**
- **We should not get embroiled in parallelization issues here**