# Priorities for SOL Physics

**D. A. D'Ippolito, J. R. Myra and D. A. Russell**

*Lodestar Research Corporation*
*Boulder, Colorado*

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# SOL convective transport is a key problem area that requires more attention (and manpower)

- SOL transport is essentially different from core transport
  - convective, not diffusive
  - highly nonlinear
  - intermittent, carried by coherent objects (“blobs”)
- SOL transport ($\parallel$ vs $\perp$) couples the core plasma to the divertor and walls $\Rightarrow$ strong influence on machine performance
- This problem encompasses a lot of physics…

| edge | near SOL | far SOL | wall |
|---|---|---|---|
| (strong turbulence, blob creation zone) | | (blob propagation zone) | (neutrals, impurities) |

# Some key questions in SOL physics

1. Which conditions produce intermittency?

   (e.g. ELMs/blobs vs Quasi-Coherent Modes or EHO)

   - need theoretical ideas and better simulations
   - relate to exper. probe, reflectometer, and gas puff imaging data

2. What physics determines blob generation? Does it explain the density limit?
   - need better 3D numerical simulations of edge turbulence
   - need measurements of blob statistics (distributions of blob size, n, T, **v**, source rate) in different experiments
   - need identical analysis tools for simulation and experimental data

   $\Rightarrow$ **scaling of SOL width with machine parameters**

   $\Rightarrow$ **relation of convective transport to density limit**

# Key SOL questions (cont.)

3. Do existing theories of blob dynamics in far SOL agree with experiments?
   - blob dynamics has several parameter regimes
   - need to compare theory (analytic models, 2D & 3D codes) with experimental data (probes, reflectometer, GPI)
   - need run time, funding, manpower (new dedicated personnel)

4. What are the interactions between blobs/ELMs with neutrals, wall and divertor? (e.g. “main chamber recycling regime”)
   - need better measurements and theoretical treatments of neutrals and plasma-wall interactions
   - develop ways of integrating turbulence and transport models