Transport studies in DIII-D with modulated heat and particle sources

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Total pages: 32 (25 text, 7 figures, 0 tables)

(Received

Abstract. DIII-D has studied thermal and particle transport in International Thermonuclear Experimental Reactor (ITER) relevant regimes. In order to better distinguish between thermal transport models it is important to test both the steady-state and time-dependent predictions of models against experimental results. Based on experiments in DIII-D, models containing the full spectral range of drift wave physics from ion temperature gradient (ITG) to electron temperature gradient (ETG) modes were in closest agreement with experimental observations. Inclusion of $E \times B$ flow shear stabilization effects was found to be important. Although some aspects of experimental observations were well matched by various models, no individual model did well matching both the equilibrium and time-dependent electron and ion behavior, clearly indicating further improvement in transport models is required. Helium transport studies in DIII-D are encouraging for ITER in that they indicate the measured particle diffusivity

is sufficient to remove helium ash fast enough to avoid deleterious fuel dilution, but other factors for ITER such as divertor geometry and pumping speed must also be assessed.

PACs Nos. 52.35.Py, 52.55.Fa