

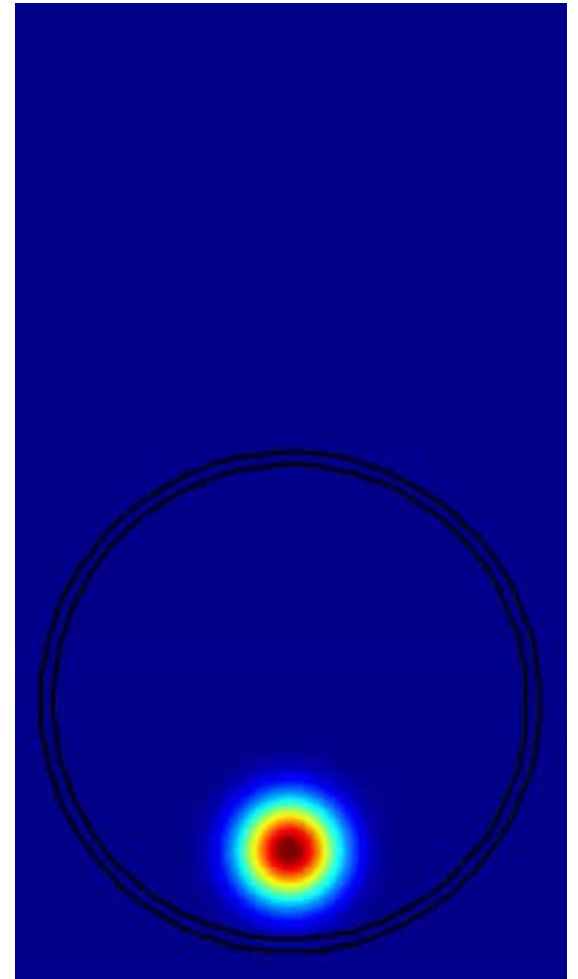
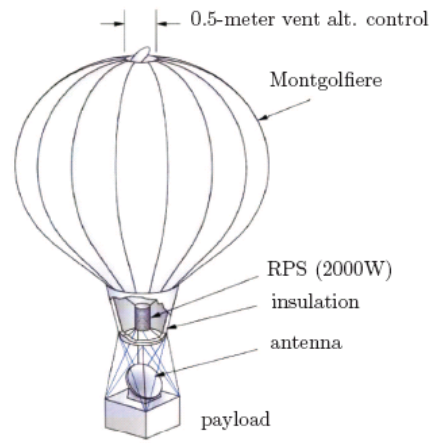
CFD of the thermal performance of a Titan Montgolfiere:

Aditya Bhujle

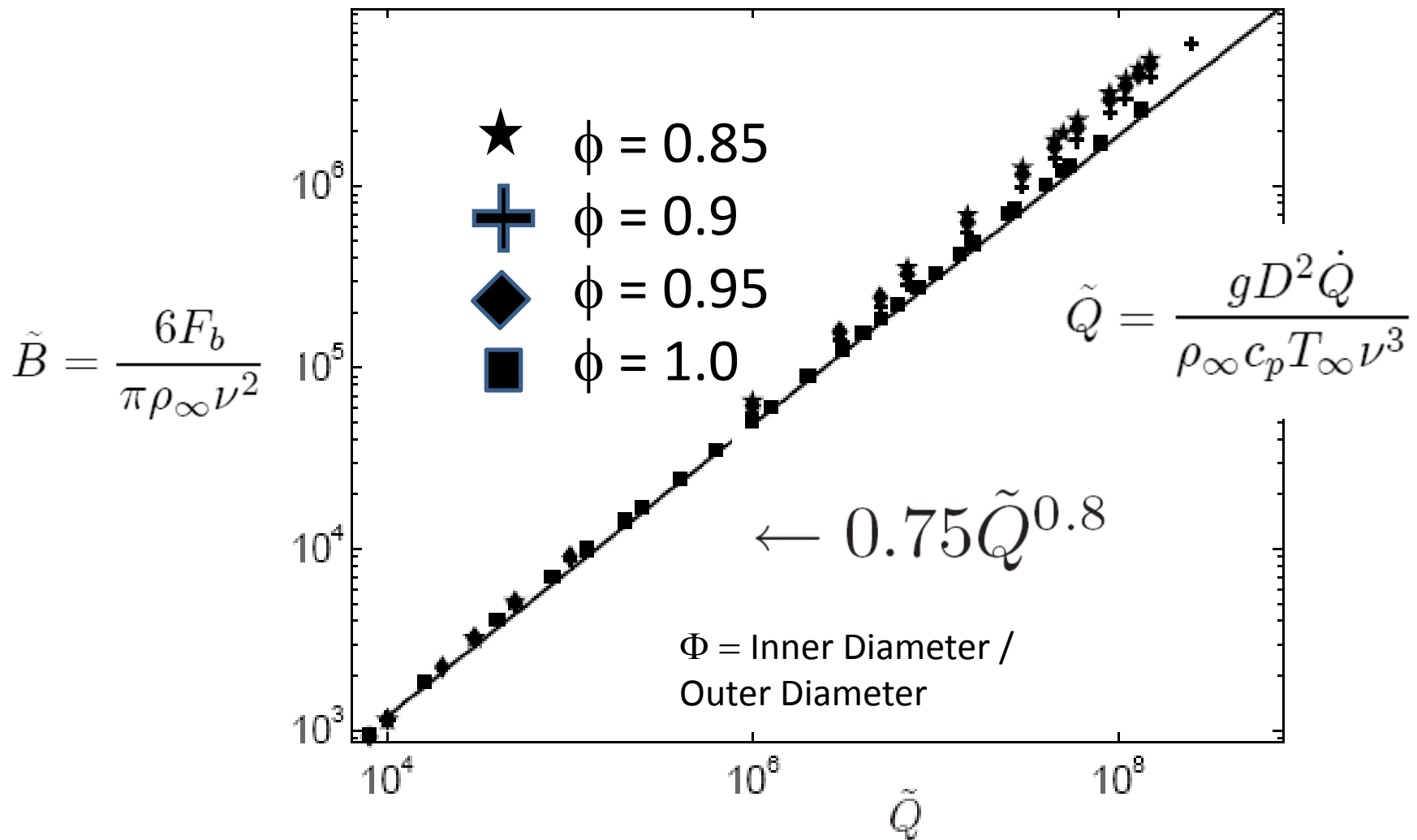
Mentor: Dr. Tim Colonius

SURF 2009

CALIFORNIA INSTITUTE OF TECHNOLOGY



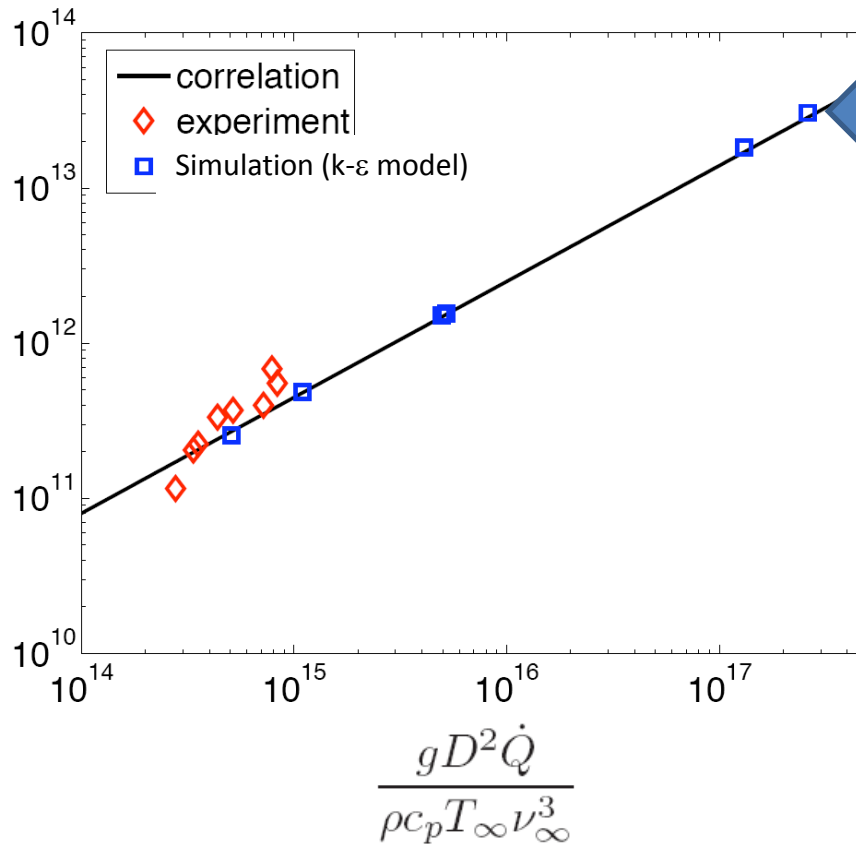
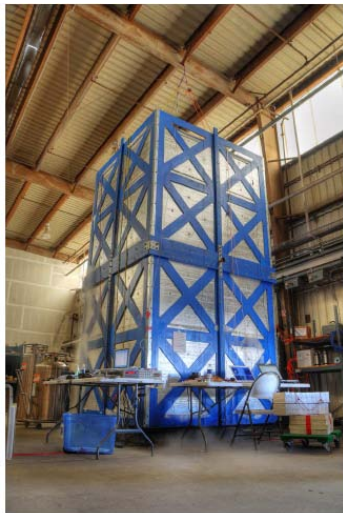
Laminar steady-state results



Theory, experiment and (turbulent) simulation

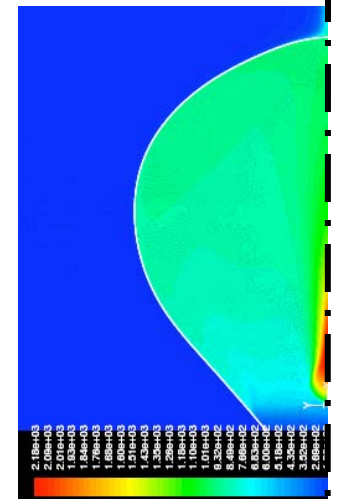


$$\tilde{B} = \frac{6F_b}{\pi\rho_\infty\nu^2}$$



Heat input = 2kW
 D = 9 m
 @ Titan atmos
 ($T_\infty = 83\text{k}$)
 Predicted load: B/g
 = 176 kg

Predicted temperature contours



Objectives (Surf 2009)

- Previous work shows that qualitative behavior of laminar regime similar to turbulent regime
- Extend laminar balloon simulations to consider transient behavior
- Control vent controls altitude
 - Need to predict transient timescales upon venting
- Previous simulations used closed balloon
 - Add realism by opening bottom