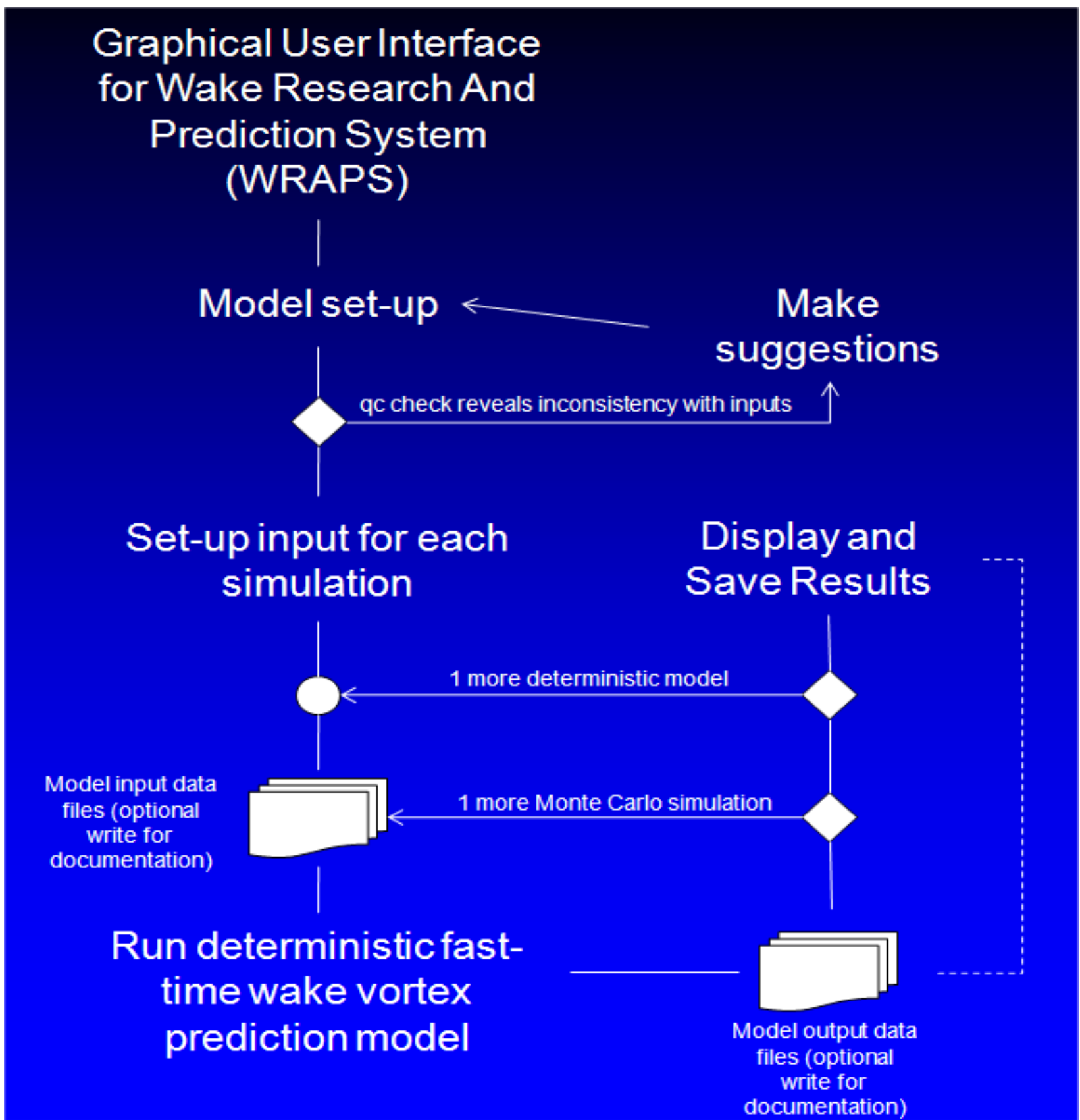
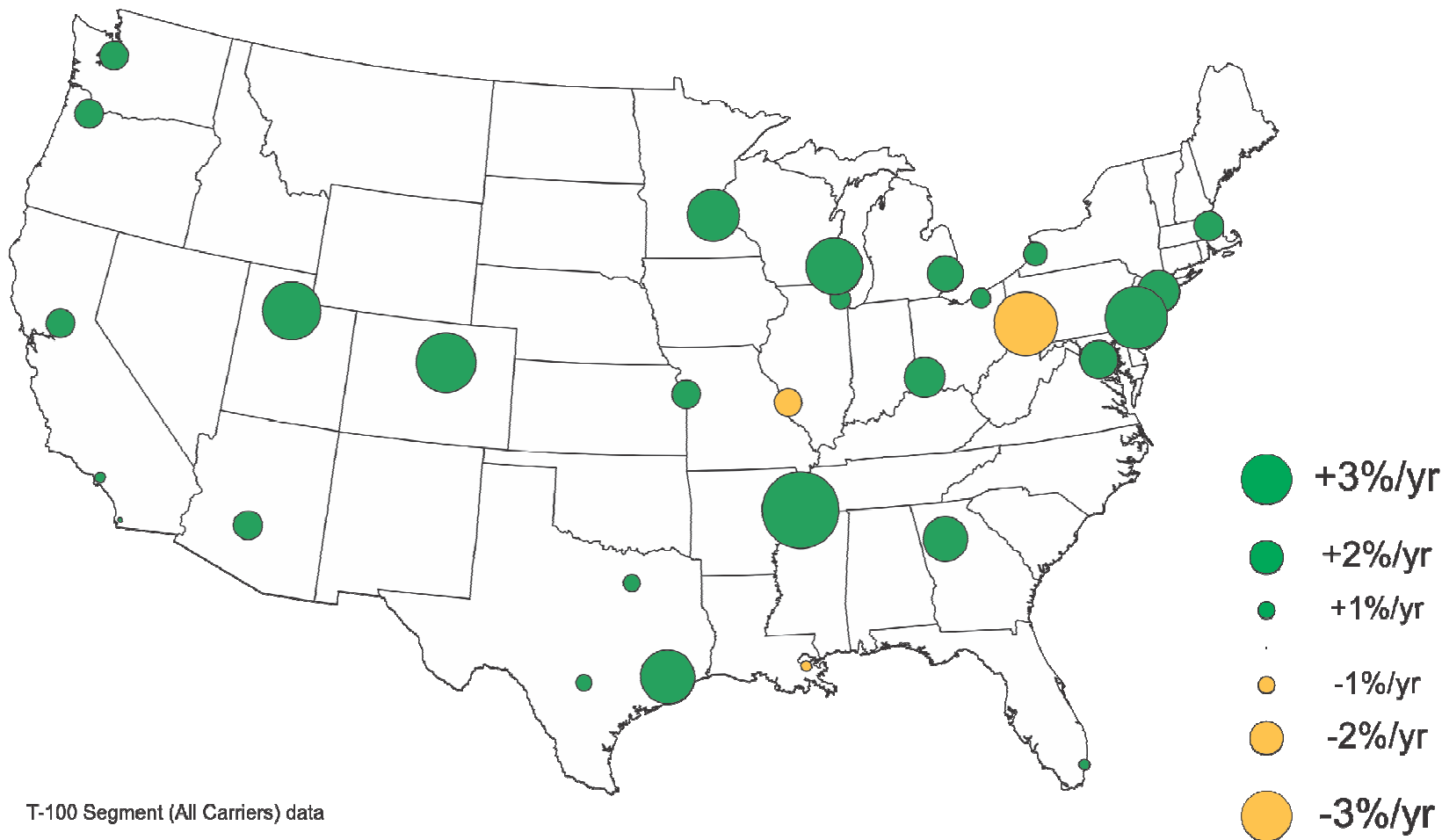


A New Probabilistic Fast-time Wake Vortex Prediction System

Annual rate of change in number of departures, from 1999 to 2009



Why Develop a New Wake Vortex Model?

- Air traffic is expected to continue growing, increasing capacity demand
- One factor limiting capacity is the separation distances that are required to ensure safety
- Current wake vortex separation criteria are sufficient for ensuring safe operations
- The key question is: Can a reduction in wake vortex separation criteria be obtained while maintaining safety?
- We propose a probabilistic, fast-time wake vortex prediction system, which would have several advantages:
 - Enables researchers to address concepts for reduced spacing
 - Enables safety vs benefits studies for new flight procedures and air traffic concepts
 - Assists in the development of separation standards for new aircraft

Wake Vortex Probabilistic Model Development Approach

- Fast-time wake vortex models attempt to predict basic vortex characteristics from the near field into the far field as a function of the generating aircraft and ambient atmospheric conditions
- Ambiguities enter into the prediction and subsequent validation of wake vortices primarily from: 1) model assumptions and simplifications, 2) uncertainties in aircraft parameters, 3) suboptimum weather information resulting from nonhomogeneity of weather conditions, changes in weather since the last observation, and uncertainties in weather sensing, and 4) wake vortex measurement errors
- An ensemble of fast-time wake vortex models is proposed, where the input parameter uncertainties (i.e., a/c position and speed, weather) are included using a Monte-Carlo approach

Comparing Wake Observations with Fast-time Models

- Results are promising
- Results indicate that model predictions and wake vortex observations are generally consistent

