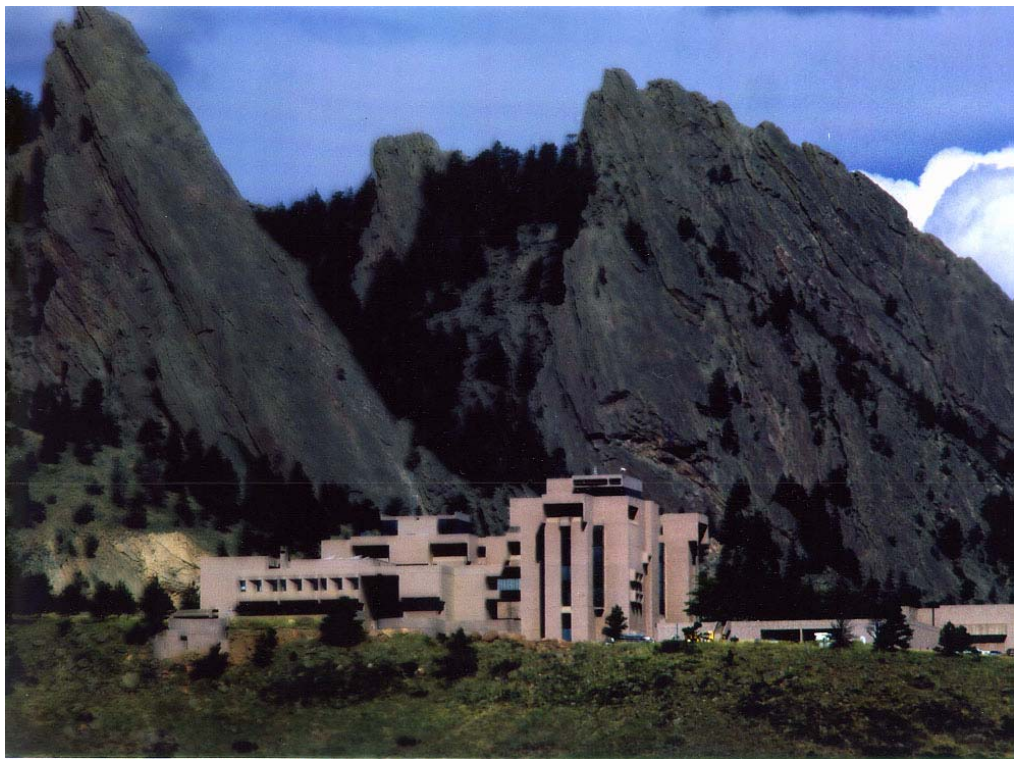
The *In Situ* Turbulence Reporting System: Development and Application



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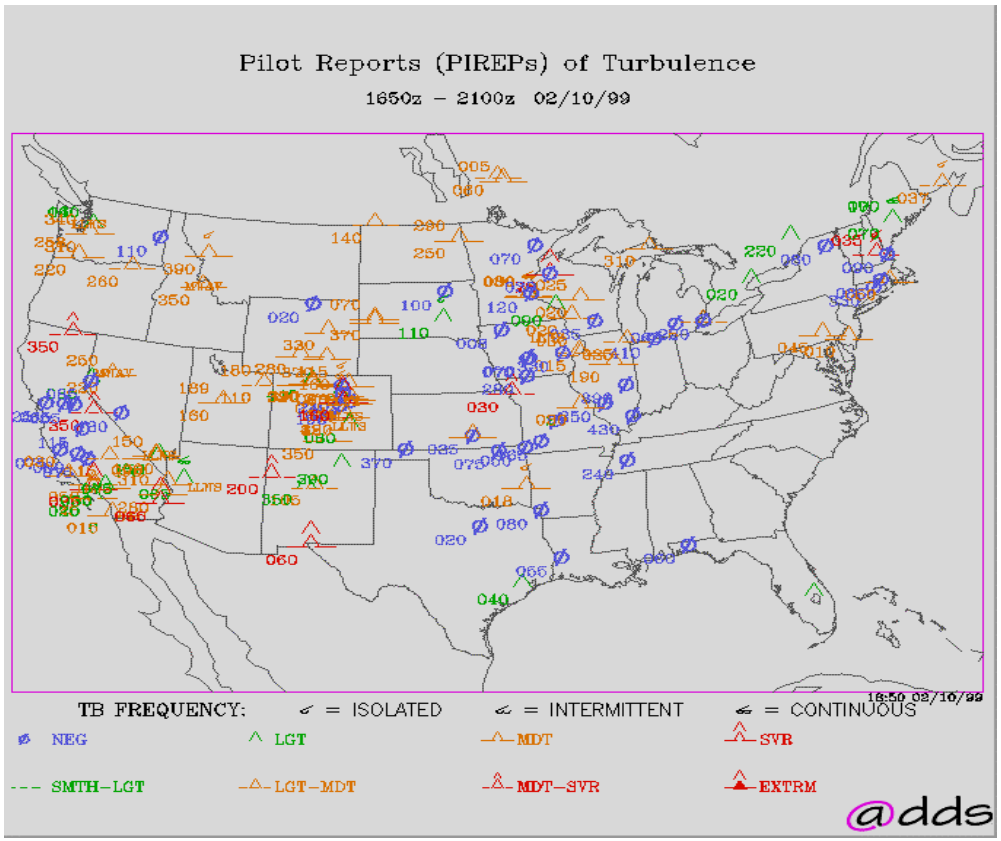
Current Observational System: Voice Pilot Reports (PIREP's)

- Currently, the only source of real-time observations.
- Inadequate spatial and temporal accuracy.
- Not all pilots report.
- Lack of null reports.
- Subjective measure.
- Dissemination of turbulence information is poor.



Historical Background

- In 1990 an ICAO Study Group was convened to set standards for the downlinking of meteorological data from aircraft.
- NCAR (under technical direction from the FAA) was asked to investigate existing and/or new methods for calculating turbulence from aircraft data.
- Based on the work of MacCready, Houlbolt and others, NCAR developed the so-called "*in situ* turbulence algorithm."

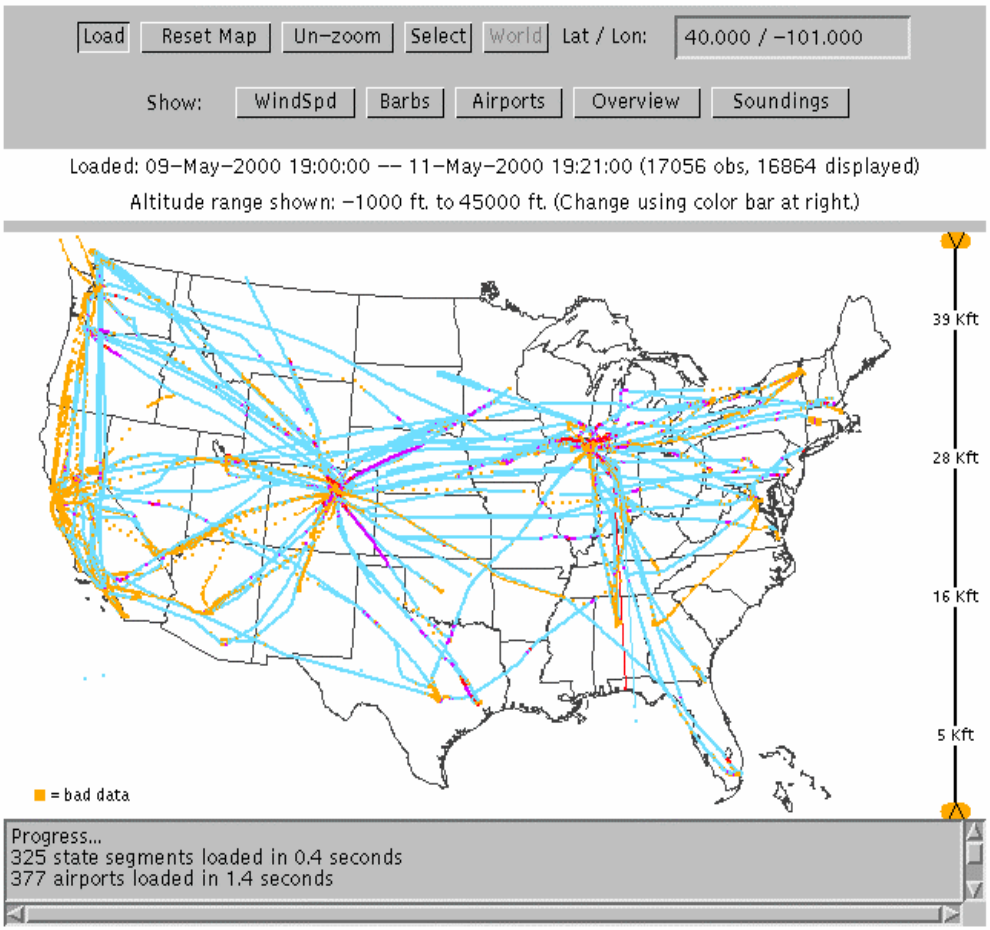
Design Goals for the *In Situ* Algorithm

- **Create an automated, objective, atmospheric (i.e., aircraft independent) measure of turbulence intensity.**
- **Supplement the existing PIREP data.**
- **Minimal impact to aircraft configuration, i.e., just software modification to the Aircraft Condition Monitoring System (ACMS).**
- **Downlink via ACARS and ADS networks.**

Uses for the *In Situ* Data

- **Will be used to generate a near real-time map of detected turbulence.**
- **Will be integrated with other turbulence information to improve nowcasting and forecasting.**
- **Will be used for tuning and verification of nowcast and forecast products.**
- **Will be used to generate a climatology of turbulence events.**

Prototype *In Situ* Web Page



Status

- NASA is leading efforts to tune and verify the algorithm.
- Reporting methodology and downlink format (for ADS) in the process of being adopted by the ICAO.
- Currently flying on 60 United aircraft in test mode (200+ eventually).
- Northwest, American and Delta Airlines to follow.