

Weather Forecasting

Micro-Weather Research & Development



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Weather Research & Development

Weather

- Observations
- Atmospheric processes
- Micro-weather prediction



Aircraft & Mission

- Performance limitations

Decision Support

- Translation of weather into operational impacts



Micro-Weather

Process Understanding

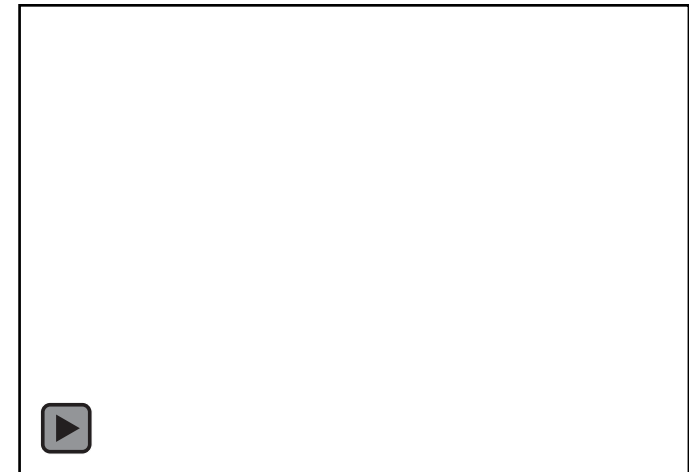
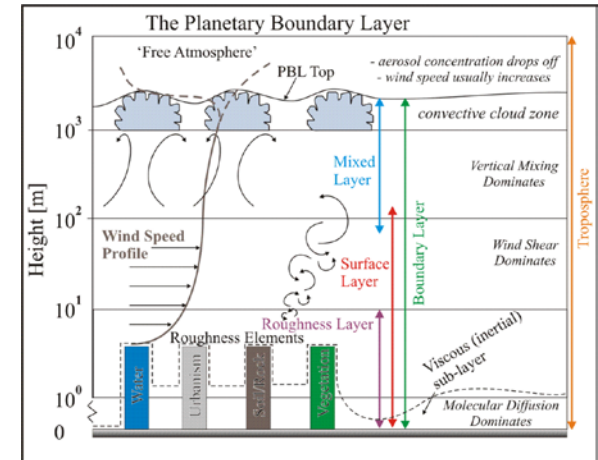
- Wide range of processes & scales
 - very dynamic in lower levels of atmosphere
- Particular challenges
 - near marked land surface contrasts (land/sea)
 - near thunderstorms (strong winds, hail, lightning, etc.)
 - in complex terrain & urban environments

Prediction Capabilities

- Improved process representation in models
 - increasing resolution & explicit prediction
 - data assimilation for model initialization
- Enhanced processing capabilities
 - enable use of GPUs for faster processing

Observations

- Key for process understanding, situational awareness, model initialization & validation
- Need more & novel observations in lower atmosphere!



Aircraft Performance & Mission Success

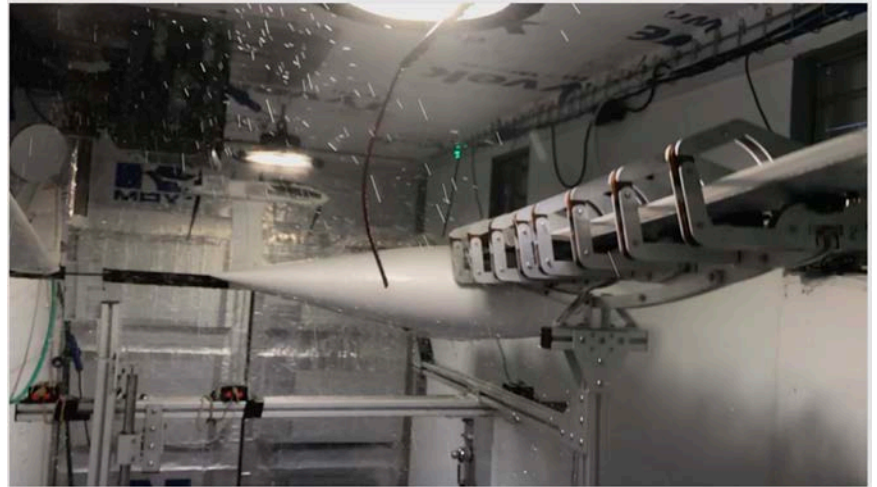
Weather Impacts

- Vehicle response to wind & turbulence
 - specific to type of aircraft
- Operation in clouds & precipitation
 - weather proofing vehicle & mission
- Mission reliability
 - sensor limitations (condensation, ice)
 - delivery challenges (wind)



Testbeds

- Controlled indoor wind tunnels
- Safe outdoor test environments
 - appropriately instrumented to understand weather impacts
- Learn how to gracefully fail



Detect & Avoid

- Needs to include sensing weather hazards

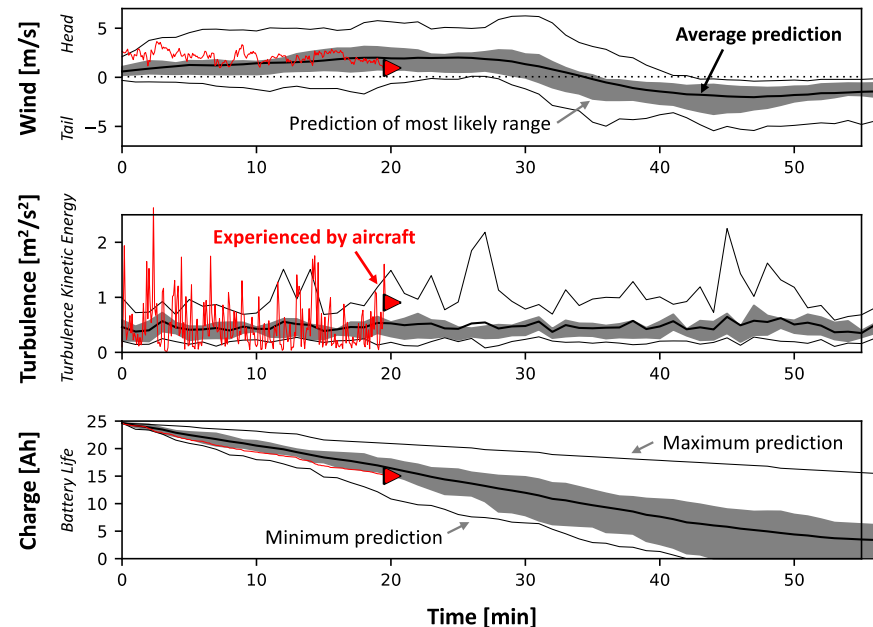
Decision Support

Limiting Weather Conditions

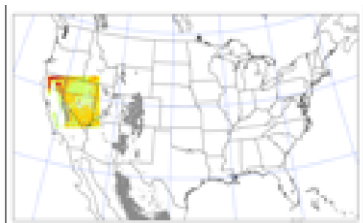
- Understanding & prediction of weather impacts on operations - operationally critical thresholds

Translation to Impact

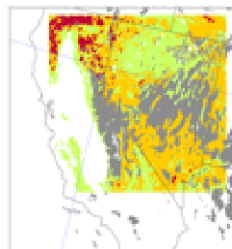
- Models of power consumption, emission & noise pollution, etc.
- Impacts along flight path & avoidance routing
- Probabilistic guidance for small scales



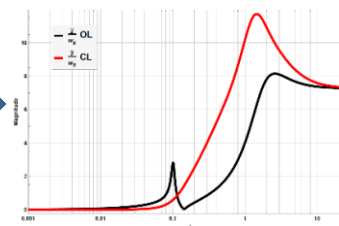
**HRRR 3km
data cutout**



**GTG Turbulence
Product**



**UAS turbulence
response**



**UAS impact
values**

