High Resolution Artillery Meteorology

S&T Campaign: Information Sciences
Sensing and Effecting

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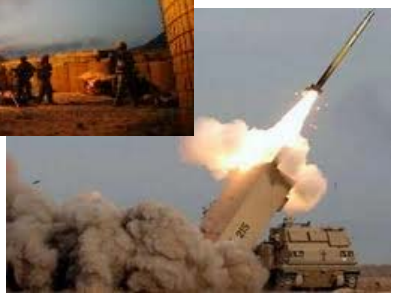
Research Objective

- **Provide "revolutionary" improvements for Artillery Meteorology (MET) including for target areas.**
- **Develop new modeling, remote sensing, and data assimilation capabilities for artillery and related applications**



MET error contributes up to 2/3 of error budget for longer ranges.

Challenges

- **Fast running dynamic microscale model not yet available or evaluated for "Army problems."**
- **Application of smaller scale model output and non-traditional observations for artillery MET and related is a new area – standard methods not adequate.**

CMD-P being replaced by PVM

MMS-P (replaced by CMD-P)

PVM using WRF

or "Virtual"

Two versions: laptop and virtual machine on server. Laptop version being fielded.

MMS-P: Meteorological Measuring Set – Profiler
CMD-P: Computer, Meteorological Data – Profiler
PVM: Profiler Virtual Module
ABLE: Atmospheric Boundary Layer Exploitation
WRE-N: Weather Running Estimate - Nowcast

ARL Facilities and Capabilities Available to Support Collaborative Research

- **ARL has and continues to develop and test numerical modeling methods and applications at very fine scales (e.g., fine scale WRE-N and ABLE).**
- **Use of ARL HPC facilities has enabled a more rapid evaluation of, for example, changes to model configurations, modifications, and changes to input files.**
- **Future upgraded version of the MSA will allow the evaluation of methods to model and measure target area atmospheric conditions.**

Complementary Expertise/ Facilities/ Capabilities Sought in Collaboration

- **Means to efficiently compute mesoscale and microscale numerical models on small, tactical devices that can operate independently of distant processing centers.**
- **Knowledge of the UK Met Office's Unified Model being adopted by the Air Force with emphasis on versions that operate at smaller horizontal resolutions.**
- **Sources of non-traditional data and means to assimilate those data without recourse to computationally expensive methods.**

List of Related Publications:

1. Cogan, J., Smith J. 2015: Meteorological (MET) Error Budget Data Based on Ballistic Meteorological Messages - Surface to Surface (METB3s) from the Profiler Virtual Module (PVM) and Co-Incident Radiosonde Observations (RAOBs): Preliminary Analysis. ARL TN-0679.
2. Cogan, J., Haines, P. 2015: Meteorological (MET) Error Budget Data Based on Computer MET Messages (METCMs) from the Profiler Virtual Module (PVM) and Co-Incident Radiosonde Observations (RAOBs): Preliminary Analysis. ARL TN-0678.
3. Cogan J, Haines P, Seik J, Wetmore A. 2014: Accuracy of Computer Meteorological Messages (METCMs) from Profiler Virtual Module vs. from Computer, Meteorological Data - Profiler. ARL TR-7149.
4. Cogan J. 2014: Accuracy of Radiosonde Observations (RAOB) and Computer, Meteorological Data-Profiler (CMD-P) During a Live-Fire Test. ARL TN-0652.
5. Cogan J, Reen, B. 2014: A Method for Extrapolation of Atmospheric Soundings. ARL TR-6930.
6. Haines P, Epler D, Cogan J, O'Brien S, MacCall B, Reen B. 2013: An Implicit 3-D Met Message for Artillery Trajectory Calculation. ARL TN-0584.
7. Dumais, R., Reen, B. 2013: Data Assimilation Techniques for Rapidly Relocatable Weather Research and Forecasting Modeling. ARL-TN-0546
8. Haines, P., Cogan, J., O'Brien, S. 2013: On the Global Occurrence of Air Density Less Than 0.9 kg/m3 at the Earth's Surface. ARL-TN-0568.
9. Cogan, J., Sauter, D. 2013: Generation of Ballistic Meteorological Messages - Surface to Surface (METB3s) rom Computer Meteorological Messages (METCMs). ARL-TN-0550.

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