Weather and Air Quality Forecasting Applications Workshop Results and Findings	
Data Products of importance to the NWP/AQ Communities	• Cloud particle size distribution and shape (or habit) mass flux in convection, Doppler capabilities to combine measurement of updraft and fall rate. • Currently there is a lack of global vertical information at a frequency and latency suitable for assimilation. • Determining the error and uncertainty is of paramount importance. Short mission life could impact the ability to do this. Well characterized errors okay but random errors harder to deal with. • Hydrological applications: Gridded precipitation products are used for everything except weather forecasting. • Radars and lidars are important for high resolution and 2-D precipitation, blowing snow, microphysics and/or radiation.
Data formats and latency needs	• Global coverage for the 6-hour data assimilation cycle would be the most desirable. • Latency of 1.5 hours optimal for both the Air Quality and NWP communities • Suggestions for improving latency – at least 2 downlinks per orbit. Use direct broadcast (DB). • Engage SpaceX to provide services to expedite data downlinks. • Disasters such as volcanoes, wildfires are hit and miss and will remain so unless we include pointing capabilities.
Revisit times	• Lidar (and some radar) data are currently not assimilated due to long revisit times and complex data structure but still useful for model verification, validation, error/uncertainty estimates and climate studies. • For some applications such as air quality forecasting, more frequent observations may be more desirable than higher quality data. • However, higher quality data is important for improving model physics and parameterizations and for validation. • Smaller sensors required to improve revisit times would probably also result in shorter mission life, which potentially limits adoption within operational data assimilation that require long (~6 month) implementation and testing periods. • Measurements from upcoming GEO platforms (TEMPO, Geostationary Environment Monitoring Spectrometer (GEMS), and Sentinel-4) should fill gaps in air quality measurements.
Errors /Uncertainty/Gaps	• Determining the error and uncertainty is of paramount importance. Short mission life could impact the ability to do this. Well characterized errors may be sufficient but random errors are harder to constrain within modeling frameworks
Orbits	• AM Orbits: Early morning aerosol data would be very useful

	• AM Orbits: Early morning also important for NWP, as there is an observational gap • PM Orbits: Important for continuity with A-train and also is useful to the precipitation community • Non-nonsynchronous orbit enables characterization of the diurnal cycle, which is important for improved parameterization of precipitation within models • Sequential lidars measuring same place but at different times of the day to get diurnal cycle (time-resolved) of vertical information
Sub-Orbital considerations	• Buoys • Ground based lidars • Instruments on ships • Measurements in different parts of the year and regions • Targeted studies of Arctic, tropical convection, orographic precipitation, snowfall, China and pollution, Malaysia, Siberia, and Indonesia for fires, East Asia and Africa for dust, Canadian fires, fires in the western US, and fire weather • New instruments, new sub-orbital platforms
Data distribution and processing	• AI and Machine Learning use expected to grow for data assimilation and model parameterizations • Cloud servers so users can process big data. • Ordering data from DAAC is not user-friendly as it could be, e.g., subsetting • Next-generation data assimilation systems are under develop now by the U.S. and Japan • Data formats, accessibility, and compatibility with existing data assimilation/model processes is integral for adoption into operations