

Causes of Dust Project Update

August 13, 2004

Desert Research Institute

Where do we stand?

1. Preliminary categorization
 - Completed first cut assessment of possible causes of dust haze for all sites where dust was the principal cause of haze on a 20% worst visibility day
 - Assessment based on qualitative inspection of hazagon maps, spatial extent of dust influence.
 - Useful only for identifying episodes for test cases (I.e., very uncertain categorization)
2. Transcontinental Events
 - Developed a method for preliminary identification of Asian dust based on aerosol chemistry. (Prior presentations provided by Jin Xu)
3. Windblown Dust Events (Local and Regional)
 - Began elucidating relationship between surface meteorological observations and dust (CM + FS) concentrations (Dave Dubois and Jin Xu provided preliminary results)
 - Beginning to consider surrogates for surface met data where it is not possible to obtain reasonable surface met
4. Wildfire Events influencing apparent dust concentration
 - Assembling databases of wildfires to examine coincidence of high “dust” and wildfire upwind.

Of these, #3 is critical step before proceeding further and main topic of remainder of progress report

Windblown Dust

- Determine if dust is windblown (locally or regionally)
 - Important to establish relationship between occurrence of dust and occurrence of wind speed
 - Surface Met maps help for large, relatively long, but not for small, short events
- Approach:
 - 1. Find relationship between representative surface met sites and dust at WRAP site (Probably reasonable)
 - 2. Try to find good surface met data for every WRAP site (highly unlikely) or a reasonable surrogate (Let's hope)

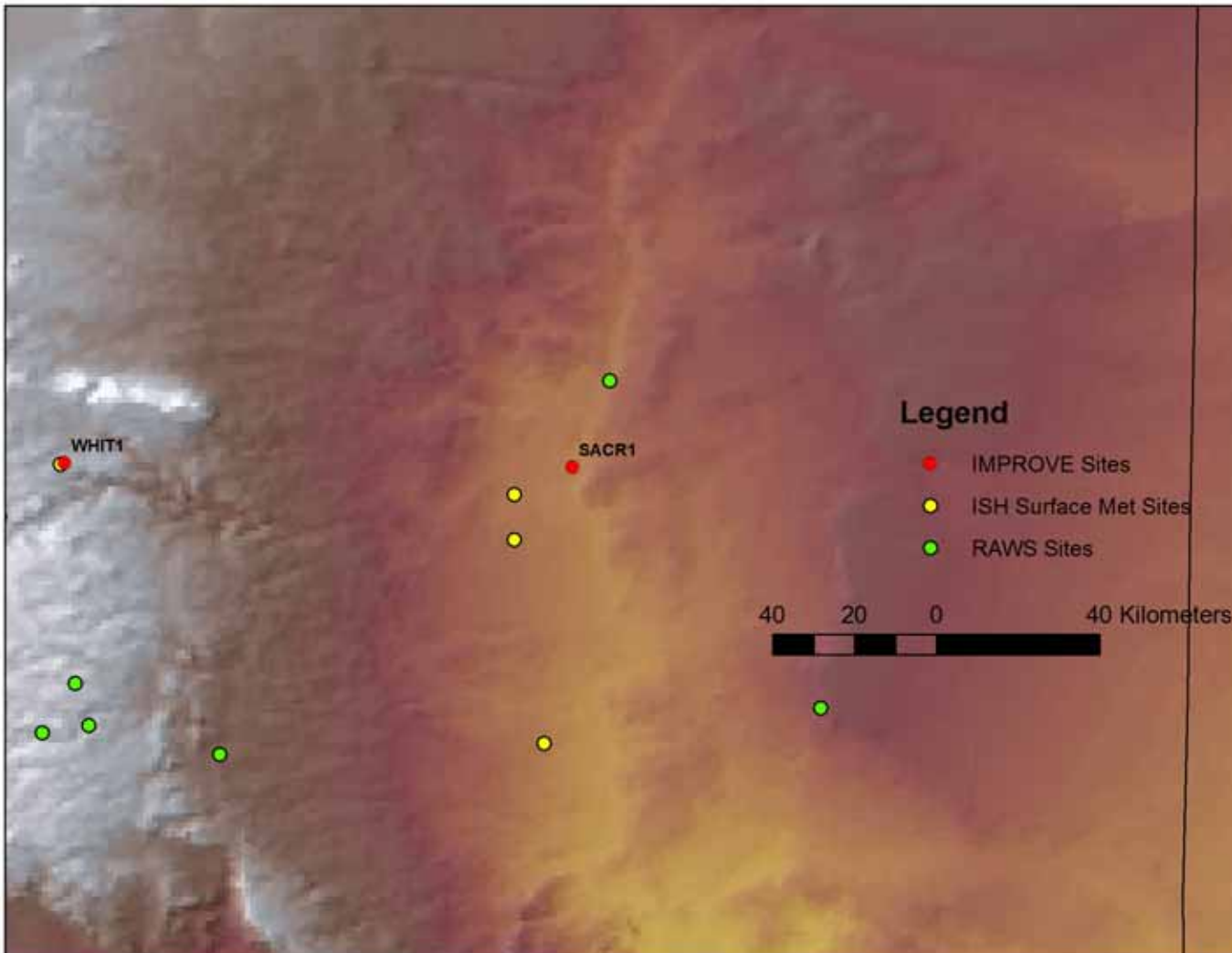
Surface Met Data

- Three reasonable networks to choose from:
 - Integrated Surface Hourly Data (NCDC)
 - Many sites
 - BUT, generally located at airports and urban areas
 - CASTNET
 - Generally collocated with IMPROVE sites
 - Very Sparse Network
 - RAWS
 - Decent probability of near-collocation with IMPROVE site
 - Periods of operation sporadic, data quality not excellent

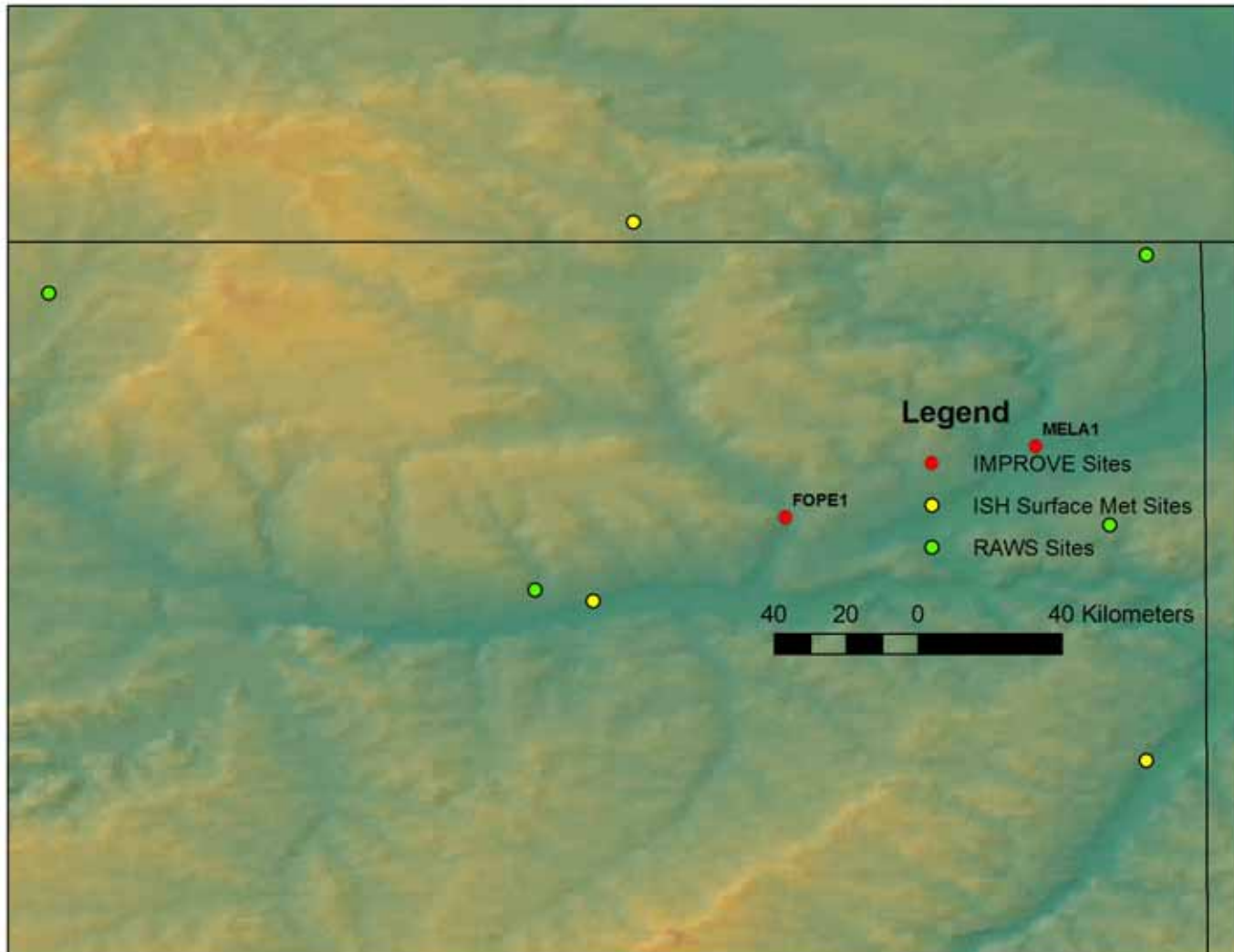
Surface Met Data

- Chose to start with Integrated Surface Hourly measurements from NCDC
 - A. Connected WRAP IMPROVE sites with potential ISH sites by applying gross criteria – Met within 200 km of IMPROVE Monitor
 - B. Individually inspected Met-IMPROVE pairs and provided quality rating (ranges are nominal)
 1. Level 1 (Probably representative): Distance < 26 km, **flat terrain in between.
 2. Level 2 (Possibly representative): Distance between 26 km and 100 km and terrain flat OR distance less than 50 km and < 120 m elevation difference.
 3. Level 3 (Probably not representative): Everything else

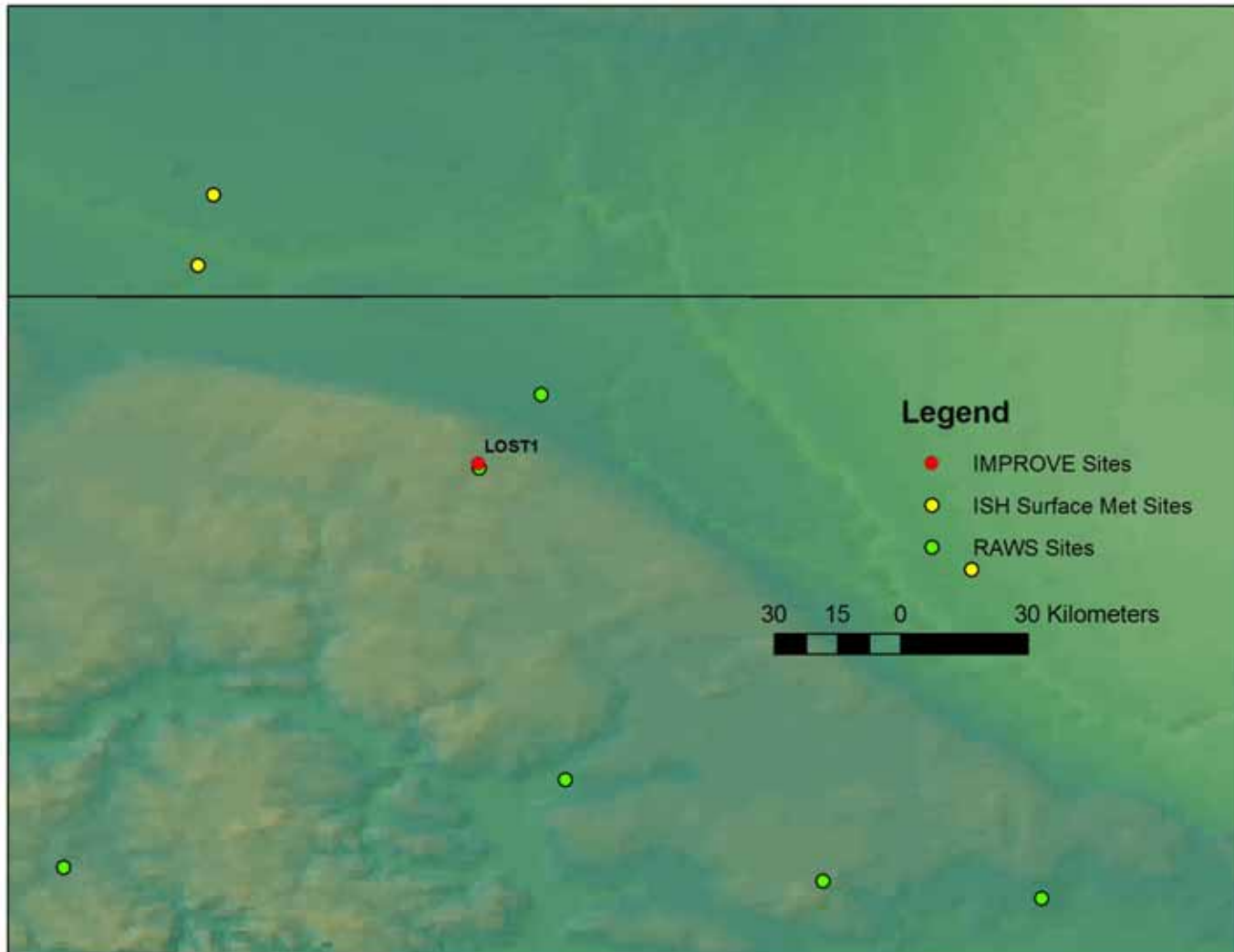
Example Level 1



Example Level 2



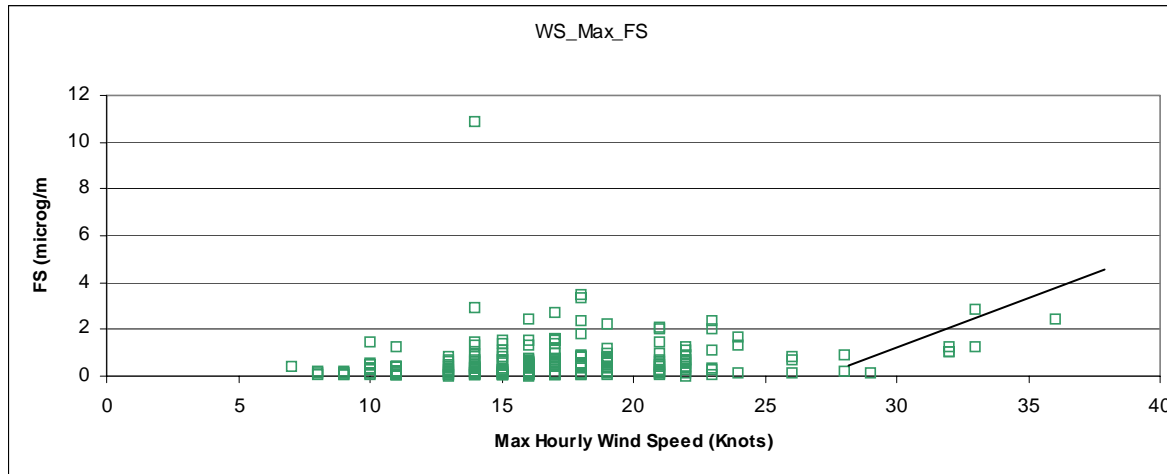
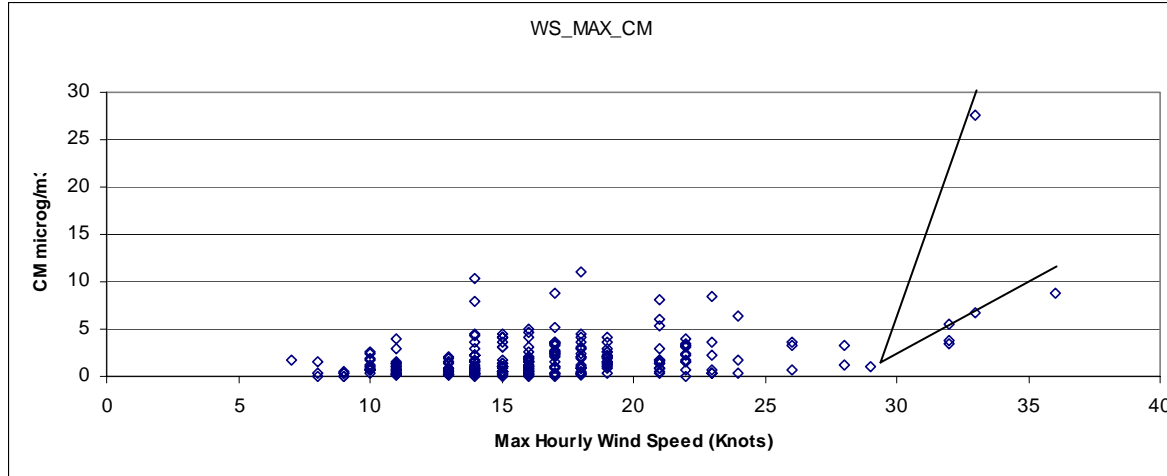
Example Level 3



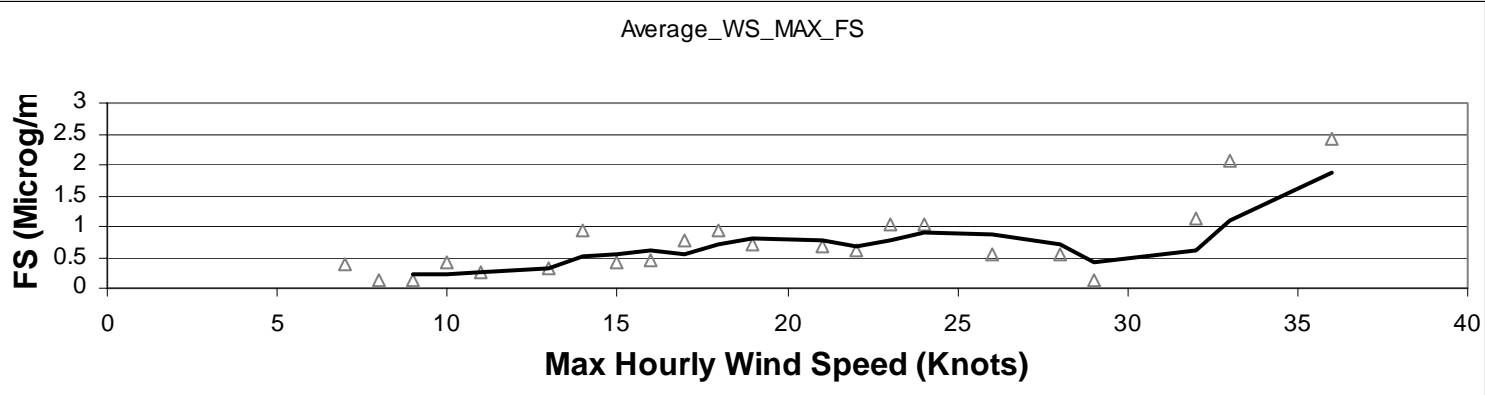
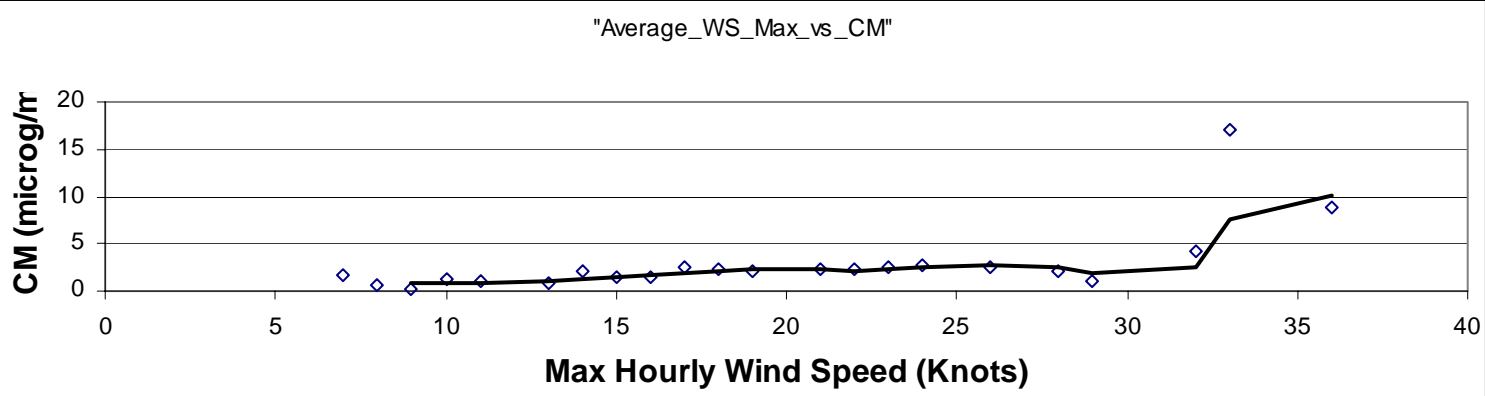
Surface Met Data

- After doing analysis
 - Level 1:
BRCA1, DENA1, **PHOE1**, PUSO1, **SACR1**, SAWT1, SIME1, TRCR1, **WHIT1**, YELL2
 - Level 2:
BADL1, BAND1, BLIS1, CORI1, FOPE1, **GRCA2**, MELA1, **PEFO1**, PORE1, PUSO1, **SAGU1**, THRO1
 - Level 3:
GLAC1, LOST1, **QUVA1**, **SAWE1**, SNPA1, SPOK1, STAR1, **THBA1**, **ZION1**

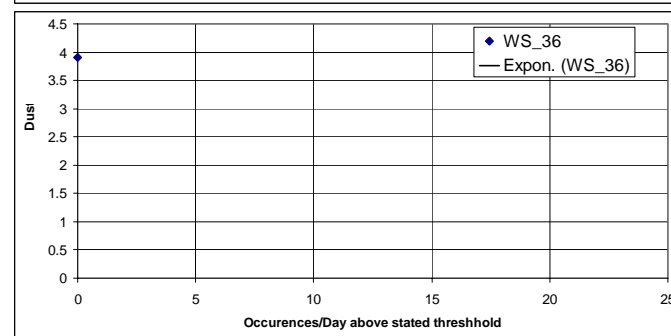
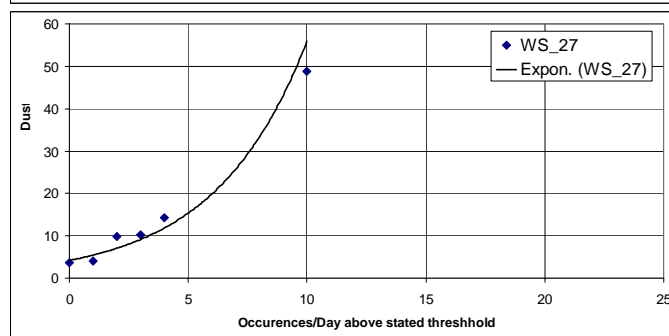
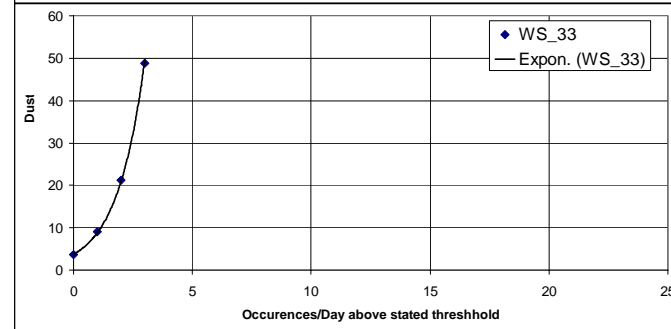
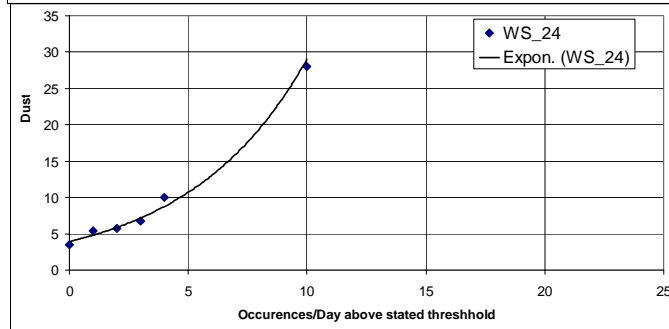
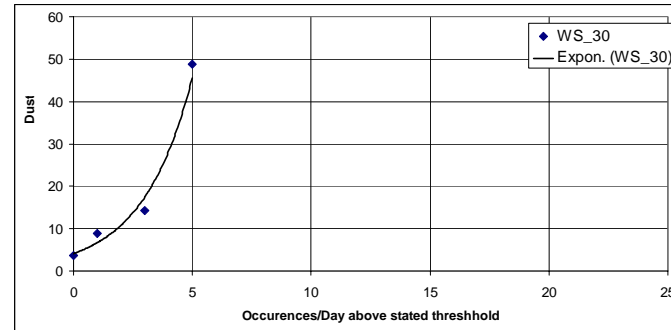
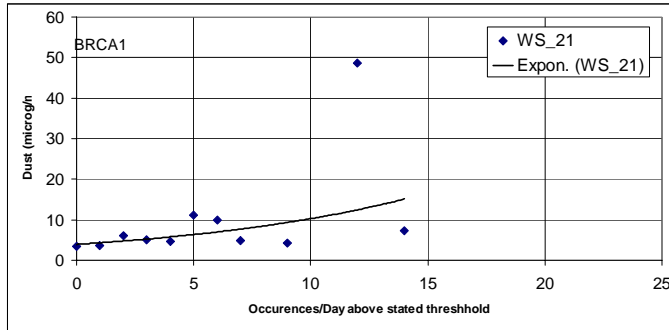
BRCA1 : Level 1 – scatter plots



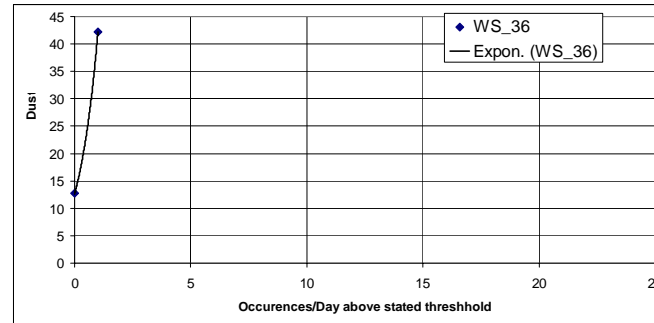
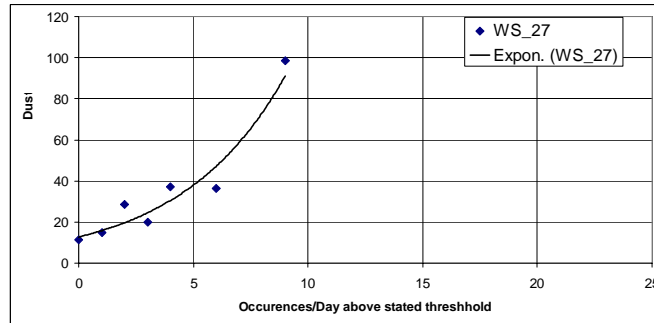
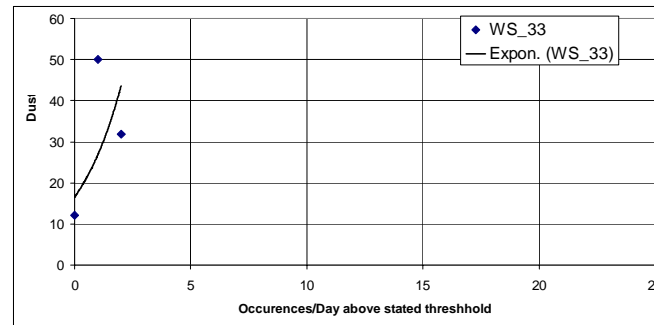
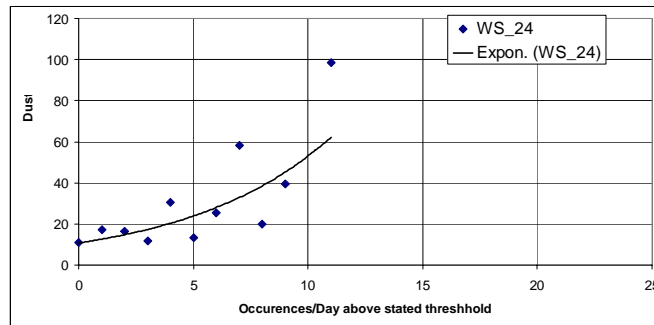
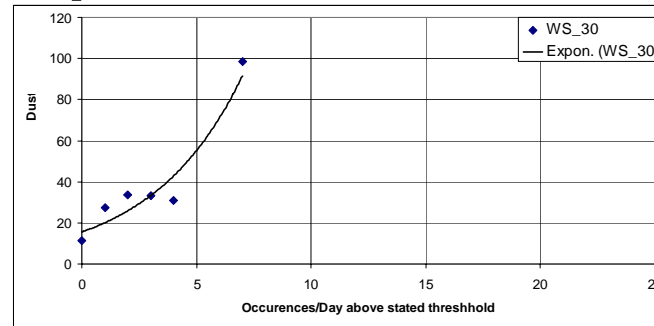
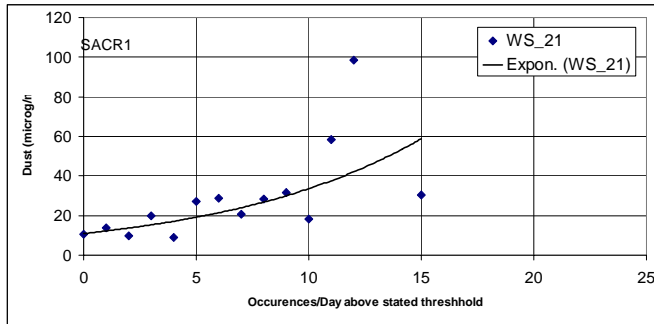
BRC A1: Level 1 – Stratified by Wind Speed



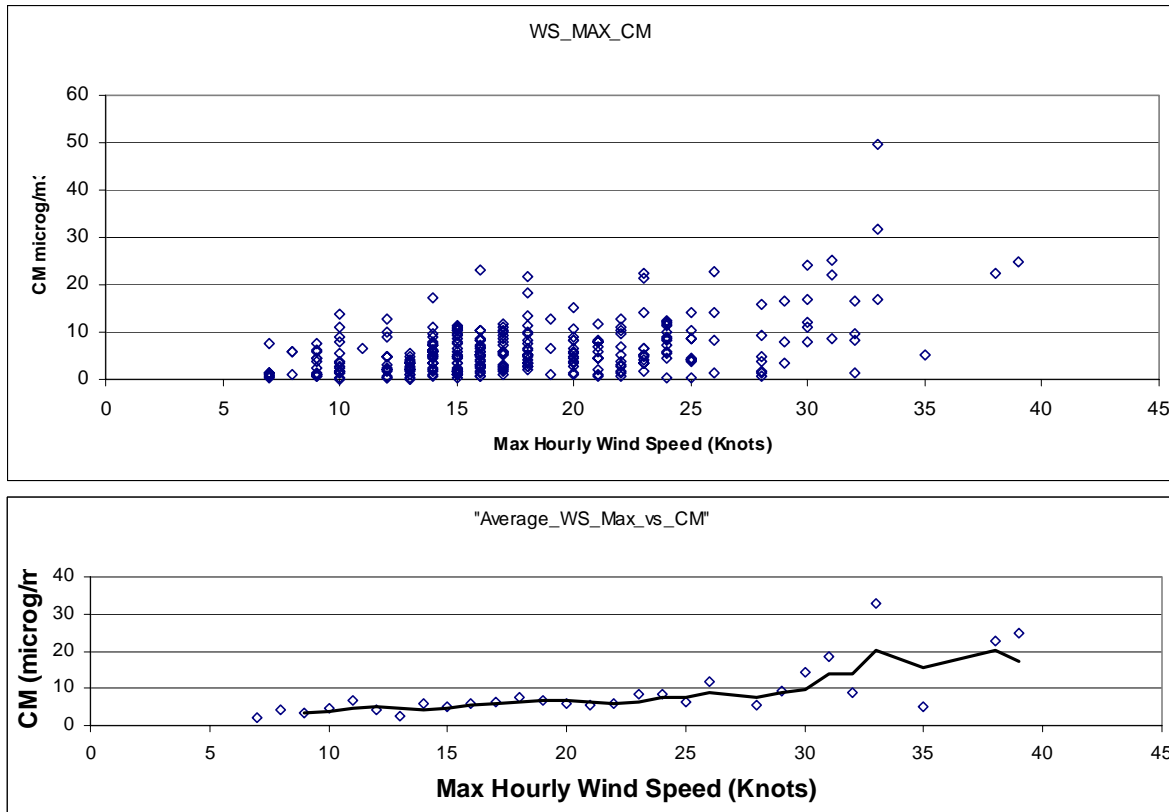
BRCA1: Level 1 – Occurrences Per Day above Specified Value



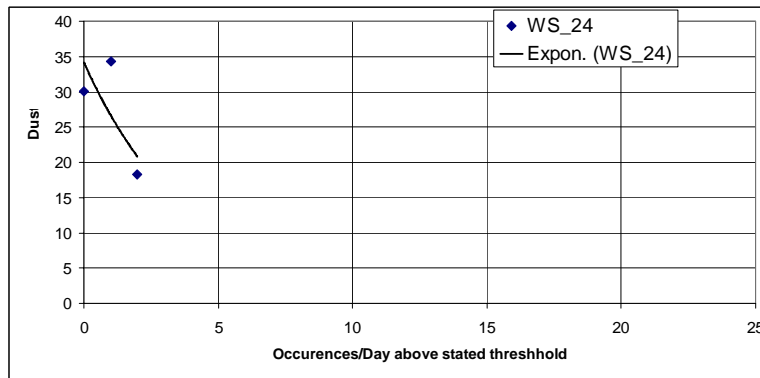
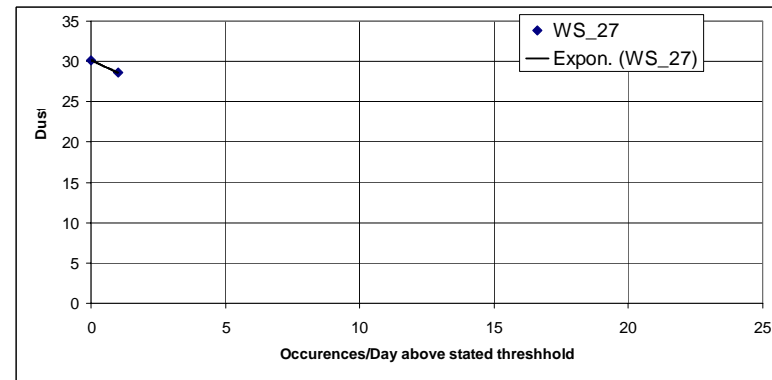
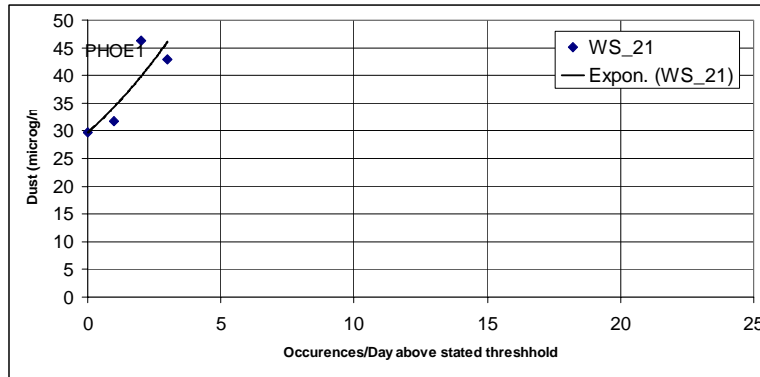
SACR1: Level 1 – Occurrences Per Day Above Specified Value



SACR1: Level 1 – Scatter and Stratified Plots



PHOE1: Level 1 – Occurrences Per Day Above Stated Value



Where to go from here?

- Decide how to determine Threshold
 - Pick Threshold value (e.g. 27 knots) and see how many occurrences above threshold. Need justification/criteria
- See how many Met sites available for useful data from RAWS and CASTNET
- See if surrogates for real data (e.g. back-trajectories) can be used to estimate WS at sites with no reliable Met
- Apply criteria to sites with “Probable Locally Generated Windblown dust”
- Assess Spatial Scales of dust events/source areas
- Assess impacts of wildfires on apparent dust