

# ***why panel discussions ?***

***thoughts on observing aerosol indirect effects  
by Ralph Kahn***

- **satellite data are often**
  - **misinterpreted** or
  - **over-interpreted**
    - *examples are*
      - MODIS ‘anthropogenic’ aerosol
      - MISR ‘SSA’
      - AERONET SSA

# ***measurement-related strengths***

- satellites can measure aerosol amount and ‘type’ (away from cloud & sometimes above cloud)
- satellites can measure aerosol layer & near-source plume elevation
- satellites can measure cloud fraction, cloud phase,  $ac$ ,  $tc$ ,  $pc$ ,  $Nc$ ,  $rc$ , LWP,  $qv(z)$ ,  $T(z)$ , cloud height
- aerosols tend to concentrate in layers, even when transported long distances
- special cases: ship tracks, aircraft contrails, stratus over smokestacks (perturbation + control)

# ***measurement-related issues***

## **please read the quality statements**

- difficult to retrieve aerosols at or near clouds
  - cloud-scattered light can affect near-cloud aerosol retrievals
- not easy to distinguish cloud from aerosol particles
  - particle hydration & cloud-processing
- optical remote-sensing does not see size  $< 100$  nm
  - significant contributions to CCN can be missed ... especially in cases of higher super-saturations
- Relationships may not be so simple (*co-variations*)
  - LWP-to-CCN relationships also depend on atmos. stability
- passive remote sensing captures vertical averages
  - local effects may be averaged out
- time & spatial scales of aerosol-cloud interactions
  - scales are not covered by satellite sampling or lab-studies

# *what should be next ?*

- current measures may not be sufficient
  - *Kaufman* {AOD; FMF}
  - *Matsui* {tc, rc, LWP; stab.}
  - *Oreopoulos-Platnick* {ac, rc}
  - *Nakajima* {tc, rc}
- statistics ?
  - *McComiskey* {PDFs of  $N_a$ ,  $w$ , LWP} parcel model
- **need quantitative tests of mechanisms**
- identify **where, when & what combinations of *new* measurements are most needed**