Conclusions

- New products on their way
- Novel ideas to use (e.g. tracking ash-cloud, trajectories, geo/leo combination
- New instruments already there (AHI, ABI)
- New instruments/capabilities coming, e.g. MTG IRS, Sentinel-4
- New technologies into operations; Lidar?
What are the most promising research tools to move into operations in satellite remote sensing?

**Current state of operational satellite-based volcanic cloud remote sensing:**

- Imagery-based ash detection schemes
- Many groups performing geostationary and LEO imager-based retrievals:
  - Some very simple (with little or no inherent error analysis)
  - Others more sophisticated – errors for free
- Many are available to a wider audience via various channels
- (Hyper-spectral) sounder-based possibly less mature? – potentially more information (PSD, composition?) – less widely available (certainly on a NRT basis)
- Possibly less emphasis on UV/Vis?

**Needs and challenges:**

- Conveying uncertainty:
  - Reconciling different spectral regions, spectral resolutions, etc.
  - Reconcile differences between products using same or similar data
- Blended products?
- Operational users converge to specific schemes?
- Next generation of geo imagers
- Reliable automated alert system
- High latitudes in Winter for “weak” cases?
Satellite Remote Sensing

• **Promising Developments:** hyperspectral retrievals, cloud growth based eruption detection, alerting services, integration of satellite data and models

• **Challenges:** full utilization of the next generation of satellites, making products with fewer caveats

• **Ultimate Goal:** a multi-sensor “best” analysis that does not require users to be experts in measurement or retrieval theory, similar to a standard meteorological analysis
### Which “split-window” BTD should be used for ash tracking?

The AHI (and ABI) have 3 channels in the “split-window” region.
Ash is easily identifiable when Band 13 – Band 15 BTD is used
Ash essentially “disappears” when Band 14 – Band 15 BTD is used
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Ash essentially “disappears” when Band 14 – Band 15 BTD is used.
The emissivity of ash clouds decreases with increasing wavelength in the “split-window” region (the opposite is true for met clouds).
The emissivity of ash clouds decreases with increasing wavelength in the “split-window” region (the opposite is true for met clouds)
False Color Imagery (12–11μm, 11–8.5μm, 11μm)

SNPP VIIRS (08/07/2015 - 05:59:22 UTC)

Annotation Key
(Annotation colors are not related to colors in underlying image)

Ash/Dust Cloud  Volcanic Cb  Thermal Anomaly
False Color Imagery (12–11µm, 11–8.5µm, 11µm)

HIMAWARI-8 AHI (08/07/2015 – 06:10:00 UTC)

Annotation Key

(abbreviation colors are not related to colors in underlying image)

Ash/Dust Cloud     Volcanic Cb     Thermal Anomaly