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Development of a GOES-R Automated Volcanic Cloud Alert System

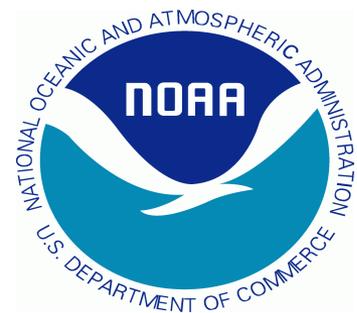
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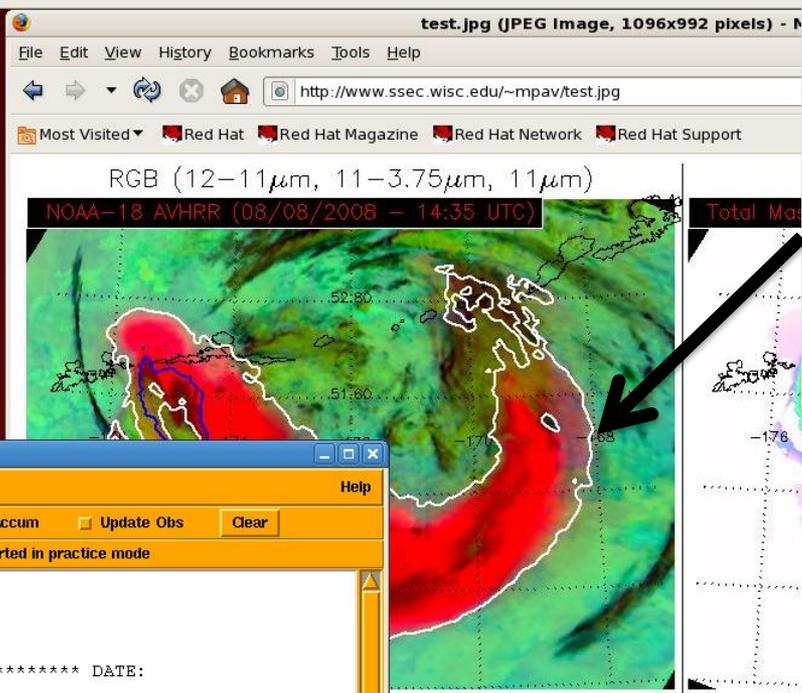
- **Multi-spectral imagery is important for tracking volcanic clouds but the information is qualitative and requires a properly trained human to interpret.**
- **The GOES-R volcanic ash and SO₂ products developed by the AWG provide important quantitative information but are not designed to issue alerts to forecasters when a volcanic cloud is sampled by the ABI.**
- **Alerts are critical for insuring that the full capabilities of GOES-R are used to help address the 5 minute volcanic ash warning capability required by the aviation industry.**
- **The goal of this project is to develop a GOES-R automated alert system that can detect nearly all types of volcanic clouds**
 - 1. Ash dominated in portion of cloud observed by passive GOES-R measurements**
 - 2. SO₂ dominated in portion of cloud observed by passive GOES-R measurements.**
 - 3. Ice topped volcanic clouds**

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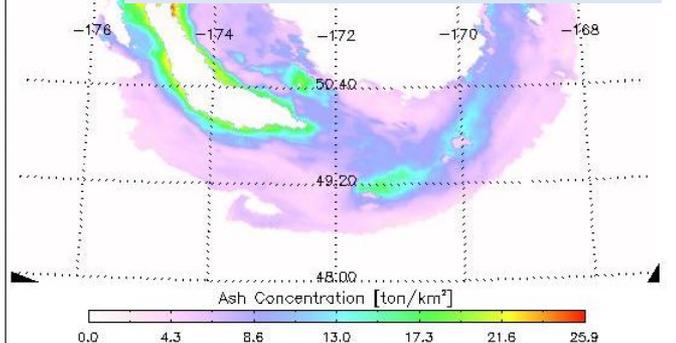
- Using robust spectral predictors (e.g. Pavolonis, 2010), a naïve Bayes classifier is used to determine the probability that a particular cloud object is an ash cloud (same procedure will be used to detect SO₂ clouds).
- Temporal trends in cloud properties will be used to determine the probability that an ice topped cloud was produced by a volcanic eruption.
- GLM detected lightning will be used to supplement the alerts (ground-based networks will be used as a proxy for the GLM) and gain insight into cloud microphysics.
- Automated alerts (to VAAC's and other interested users) can then be issued for clouds that exceed a user define probability that are near volcanoes of interest.

******The very high accuracy of the volcanic cloud detection scheme developed will be much better suited for data assimilation and model verification work than traditional detection methods and collaborations with modeling groups are underway (e.g. Schmehl et al., 2011).***

Thu 16 Sep 2010 20:20 UTC
Thu 16 Sep 2010 20:20 GMT
Alarm/Alert
Text 1: MKEWRKASH
Text 2
Text 3
Text 4



Results of ash detection are contoured on top of imagery and shown in tandem with baseline GOES-R ash products (ash height, loading, and effective radius)



```
Text 1: MKEWRKASH
File Edit Options Version Tools Scripts Products Help
AFOS Browser Load History WMO Search Enter Editor Accum Update Obs Clear
AFOS Cmd: WMO and AWIPS queries are not supported in practice mode
ZCZC MKEWRKASH ALL
TTAA00 KMKE 162004
...THIS IS A TEST...
*****GENERATING VOLCANIC CLOUD WARNINGS***** DATE:
08/08/2008
TIME: 14:35 UTC
SATELLITE: NOAA-18 AVHRR
LIB FILENAME: NSS.HRPT.NN.D08221.S1435.E1448.B1658686.GC
ORBIT NUMBER: 1658686
NUMBER OF ASH CLOUD WARNINGS: 1
NUMBER OF VOLCANIC CB WARNINGS: 0
NUMBER OF VOLCANIC HOT SPOT WARNINGS: 0
*****
VOLCANIC ASH CLOUD FOUND
RADIATIVE CENTER (LAT, LON): 51.855, -175.294
MEAN VIEWING ANGLE (DEGREES): 53.47
MEAN SOLAR ZENITH ANGLE (DEGREES): 100.96
NEARBY VOLCANOES:
SERGIEF(32.06 KM)
KASATOCHI(38.71 KM)
KONIUJI(42.13 KM)
GREAT SITKIN(62.37 KM)
ATKA(95.31 KM)
FALSE ALARM POTENTIAL: 0 OUT OF 276994
MAXIMUM HEIGHT: 10.9 KM (35890.07 FT)
MEAN TROPOPAUSE HEIGHT: 10.9 KM (35917.70 FT)
MEDIAN EFFECTIVE RADIUS: 5.05 MICRON
TOTAL MASS: 486.67 KTONS
TOTAL MASS OF FINE ASH: 9.45 KTONS
TOTAL AREA: 58982.00 KM^2
*****
$$
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Text report containing quantitative information on cloud location, detection uncertainty, cloud properties, and background environment

