

Update on Satellite Observations

Roger Saunders and Chris Velden

- Current Status
- Future Geostationary
- Future Polar
- Impact of Satellites in NWP (Met Office)

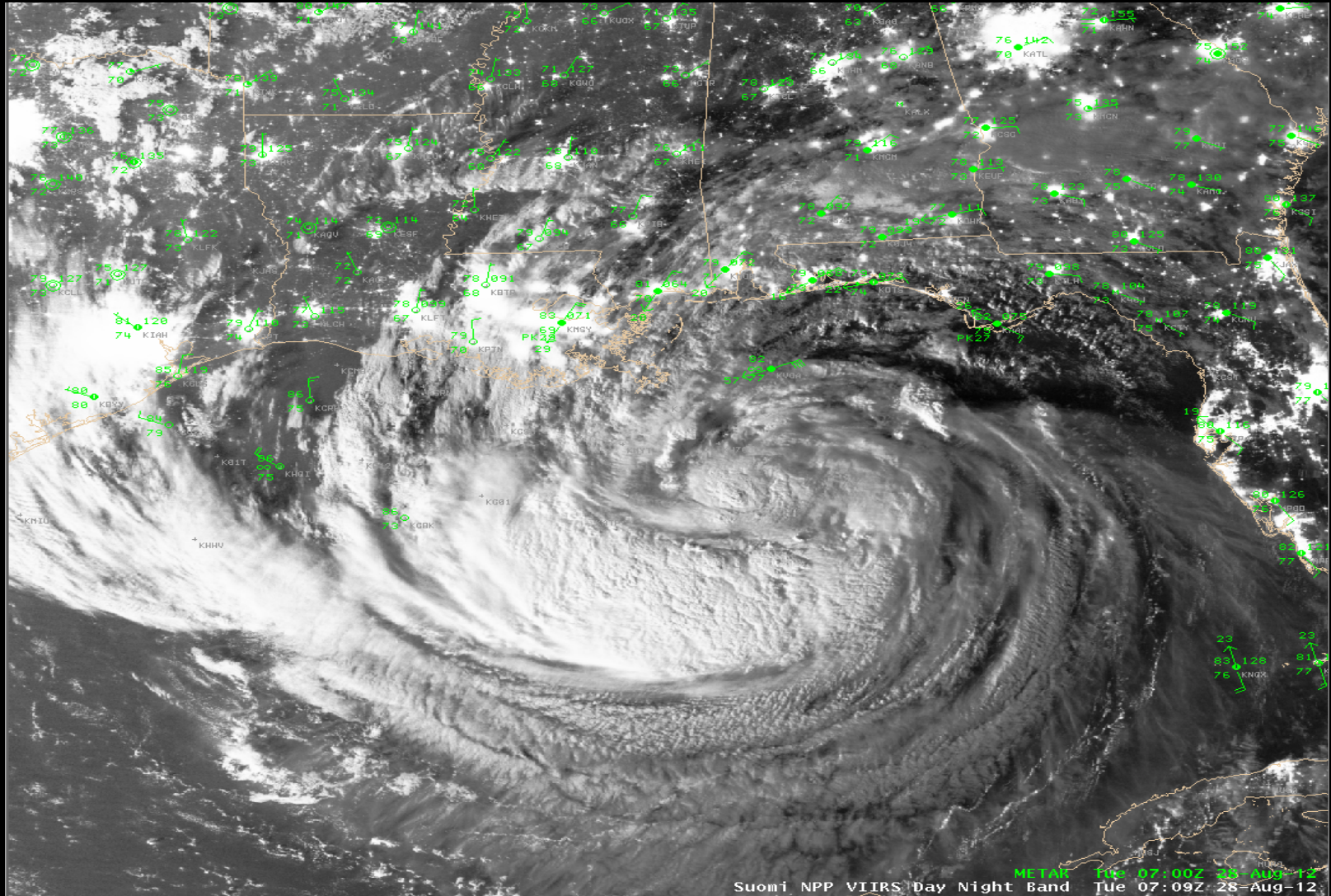
Current Status

- Operational geostationary satellites—
 - USA:** GOES-13 (East), -15 (West), -12 (S. America);
 - EUMETSAT:** METEOSAT-9 (0 Deg.) & -7(Indian Ocean);
 - India/ISRO:** Kalpana & INSAT-3A
 - CMA:**FY-2E & F; **KMA:**COMS; **Russia:**GOMS-2; **JMA:**MTSAT-2
- METEOSAT-10 successfully launched (will replace -9 on 14 Jan 2013; -9 will become rapid-scan; -8 will become backup)
- ISRO OceanSat-2 scatterometer now “operational”
- ISRO/CNES Megha Tropiques launched October 2011 (expect distributed data in early 2013)
- Suomi-NPP launched October 2011 (ATMS, CrIS, VIIRS, OMPS)
- Japanese GCOM-W1 launched May 2012 (AMSR-2)
- METOP-B launched Monday! (more ASCAT coverage+dual AMVs)
- Loss of ENVISAT in April 2012 (AATSR, Schiama, MERIS)
- **McMurdo DB is online reducing data delays by 50%**

SUOMI-NPP: Current Status

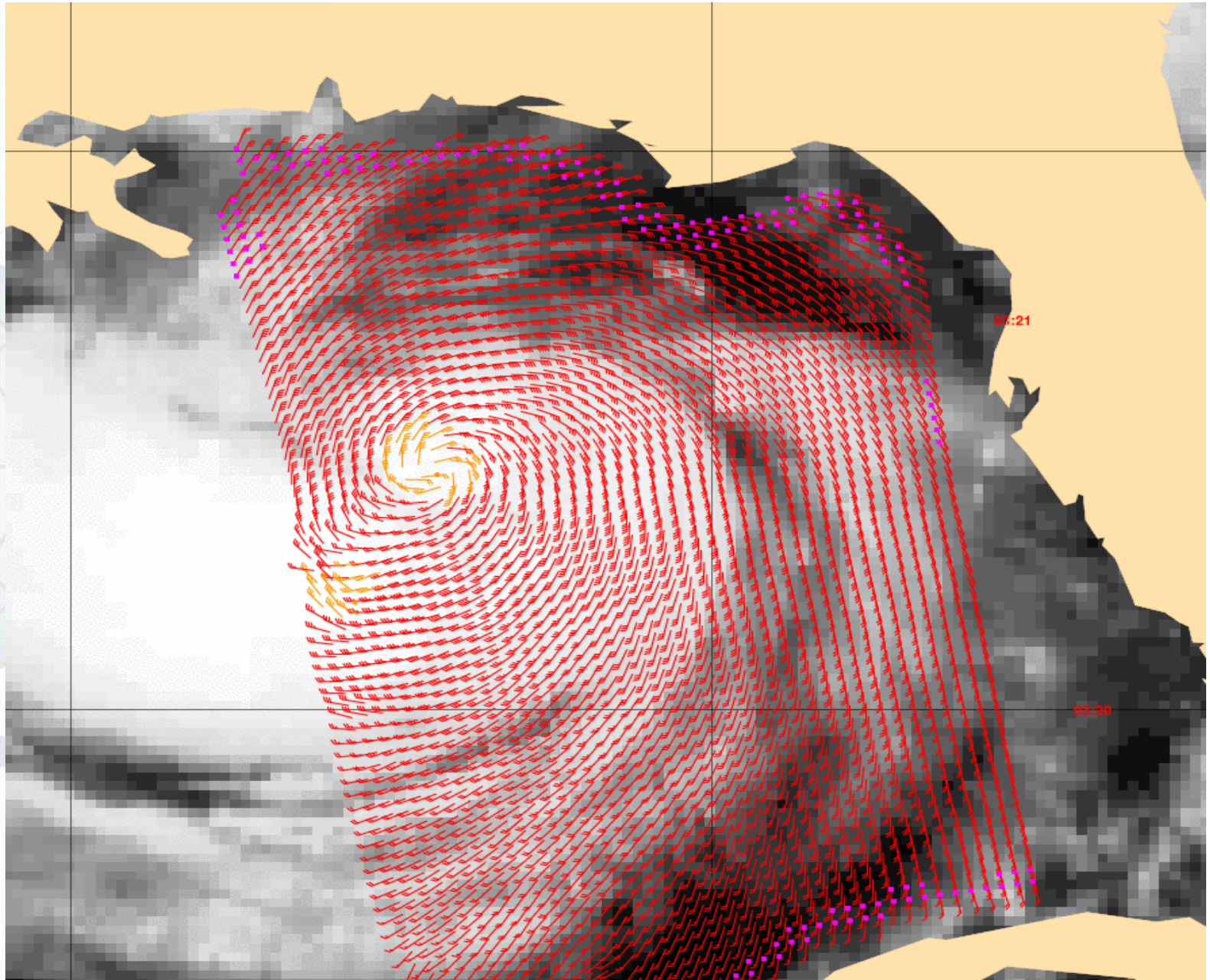
- "Operational" is a matter of interpretation. However, "provisional" might be what most would call the current status of the observations.
- VIIRS SDRs (sensor data records) are "beta" now and will be "provisional" soon. The VIIRS SDRs are now available to the public through NCDC's CLASS system. Many VIIRS EDRs (products) are in beta, but others won't be beta until the first half of 2013.
- CrIS SDRs will be provisional soon; CrIS EDRs are scheduled to be provisional in December.
- OMPS is a mixed bag. See the link below.
- ATMS data looks good.
- NPP updates and details:
<http://www.star.nesdis.noaa.gov/jpss/Data.php>.

SUOMI-NPP VIIRS low-light imagery



VIIRS Day/Night Band view of Hurricane Isaac

ASCAT monitors TS ISAAC

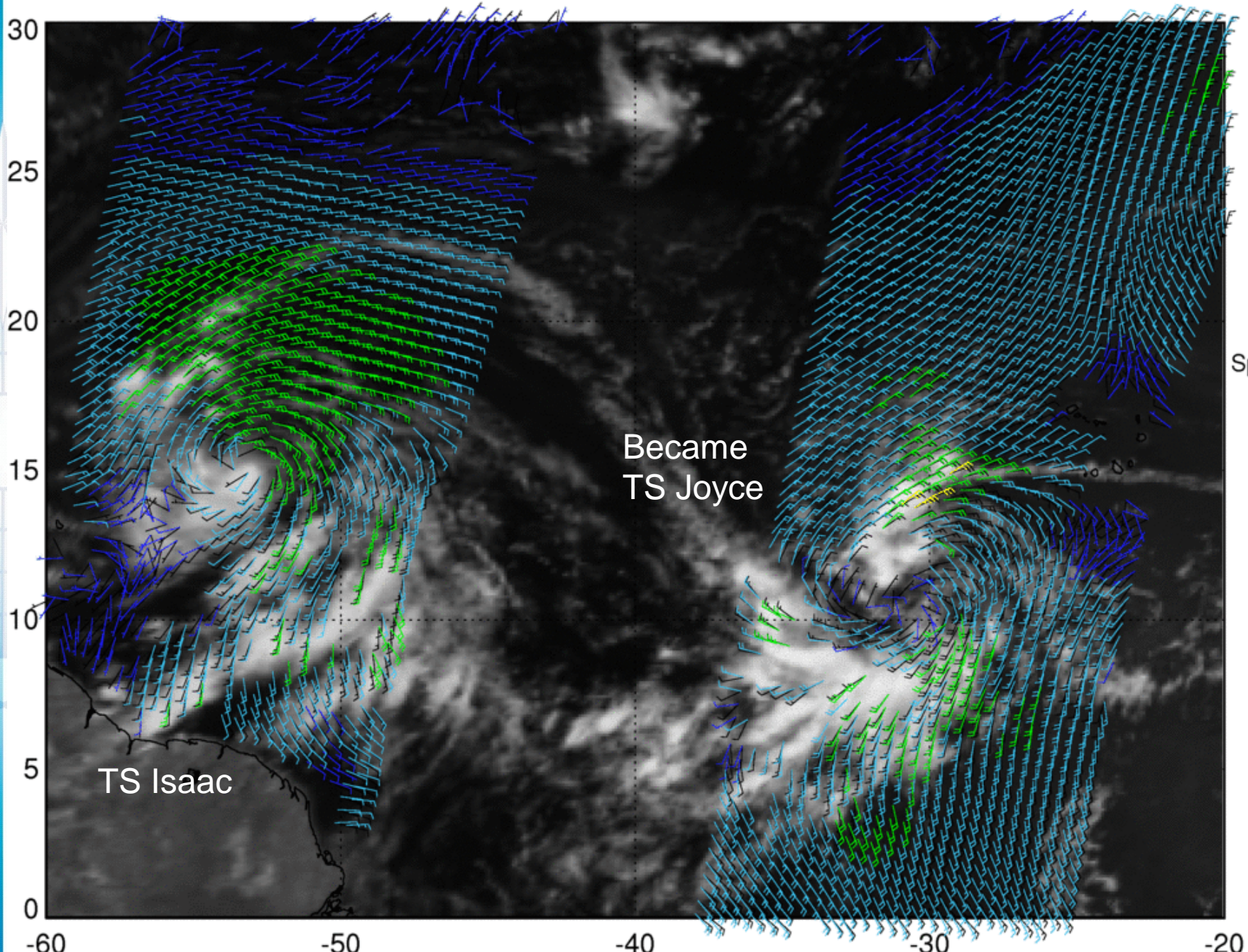


Oceansat-2 50km: 20120821 1538Z/1400Z, MSG VIS:1530Z

THORPEX

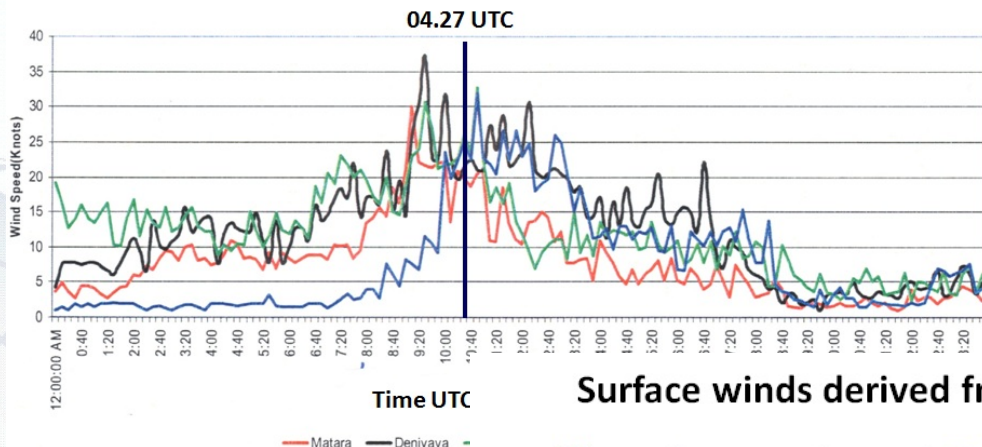


WMO
OMM



Sri Lankan Storm 25 Nov 11

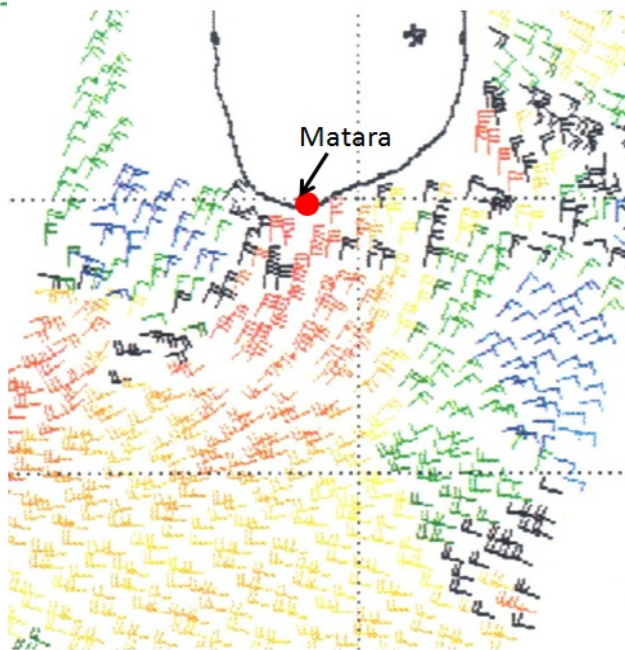
Wind speed, 25th of November



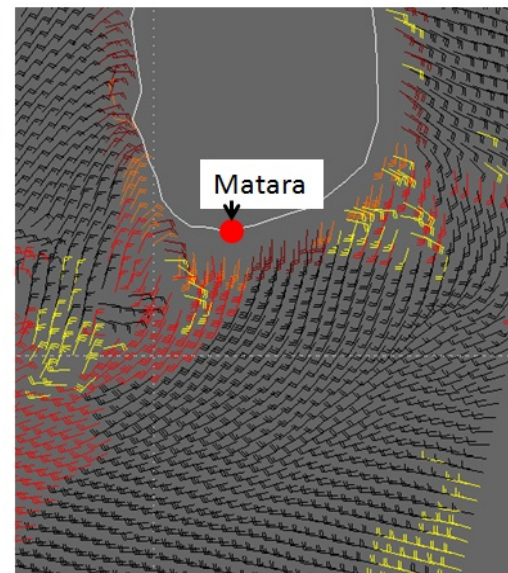
ASCAT products

Surface winds derived from a satellite-based scatterometer

Many fishermen were lost off the south coast of Sri Lanka



NOAA / NESDIS

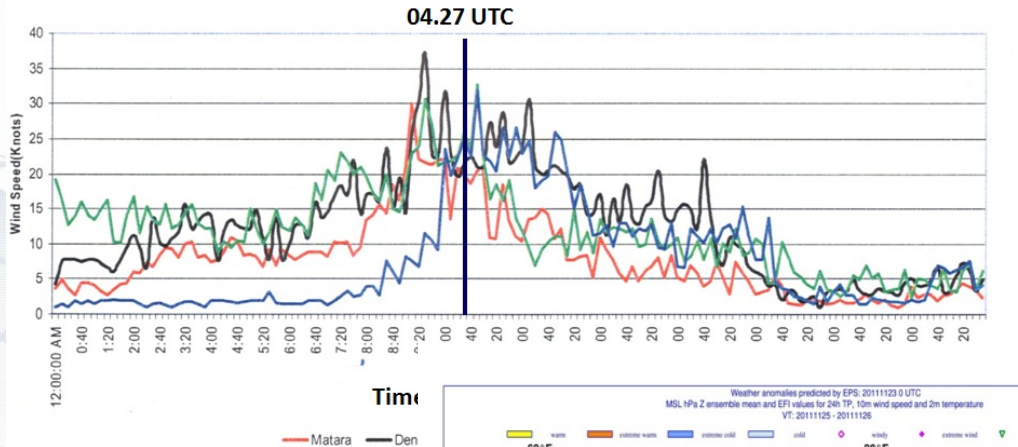


EUMETSAT

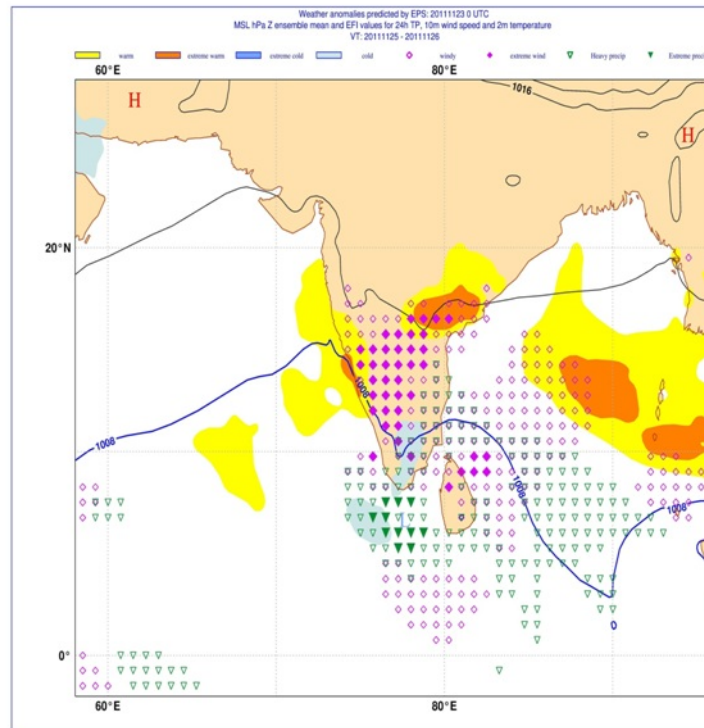
Both data sets for 04.27 UTC, 25th of November

Sri Lankan Storm 25 Nov 11





Wind speed, 25th of November



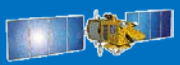
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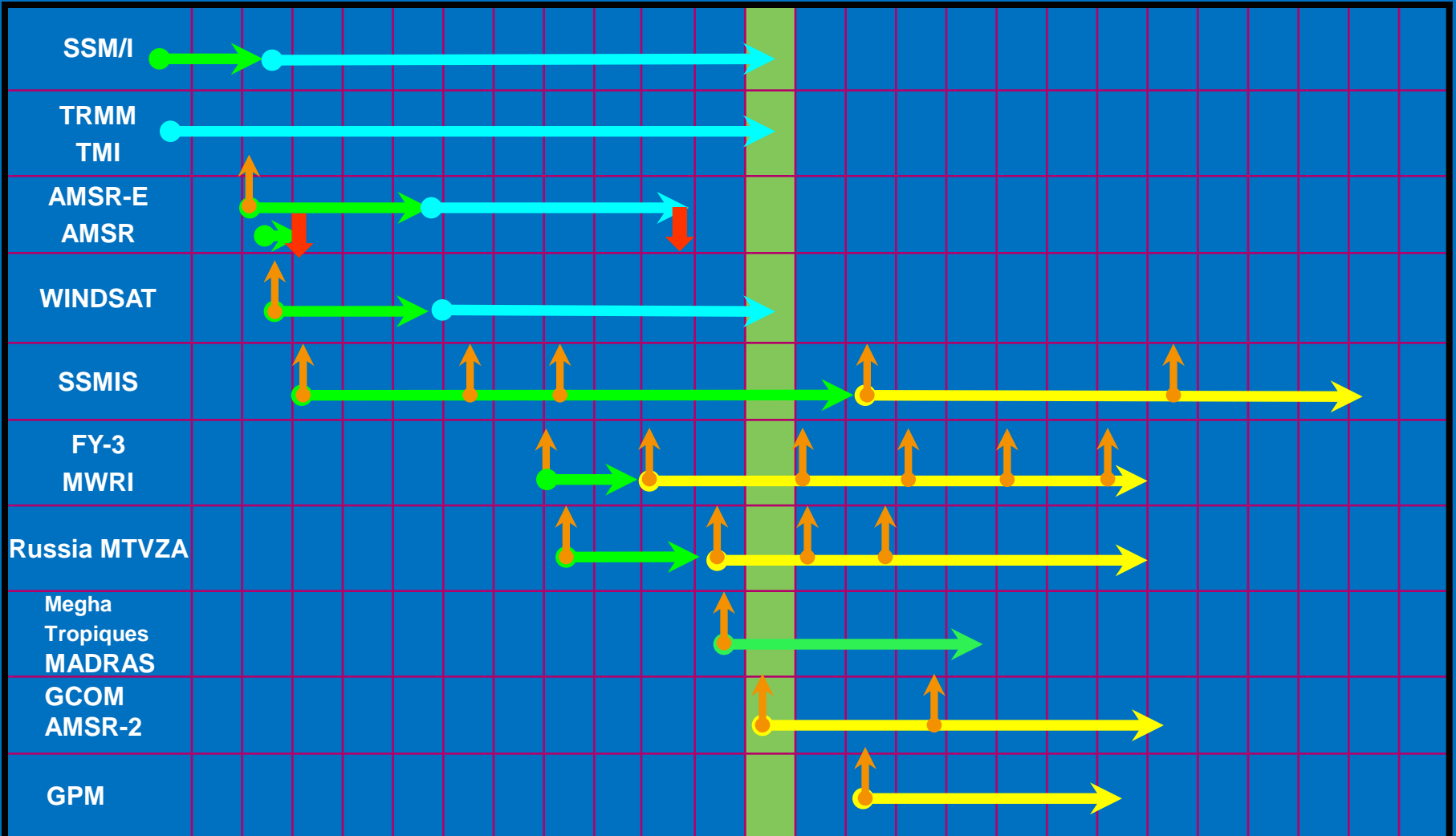
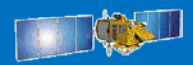
ECMWF EFI

-  Extreme Precipitation
-  Heavy Precipitation
-  Extreme Wind
-  Windy

EPI Forecast for 25 to 26 November 2011, run from 23 November EPS of ECMWF



Passive Microwave Imager Missions



DWSS (DMSP follow-on) Status Unclear – in ‘Analysis of Alternatives’ stage

YEAR	01	02	03	04	05	06	07	08	09	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
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↑ Launches
 → Primary mission
 → Extended mission
 → Future



Proposed EPS-SG satellites and sensors

SATELLITE A

- IRS / IASI-NG
- MWS
- VII / METimage
- UVNS / Sentinel-5
- 3MI
- RO

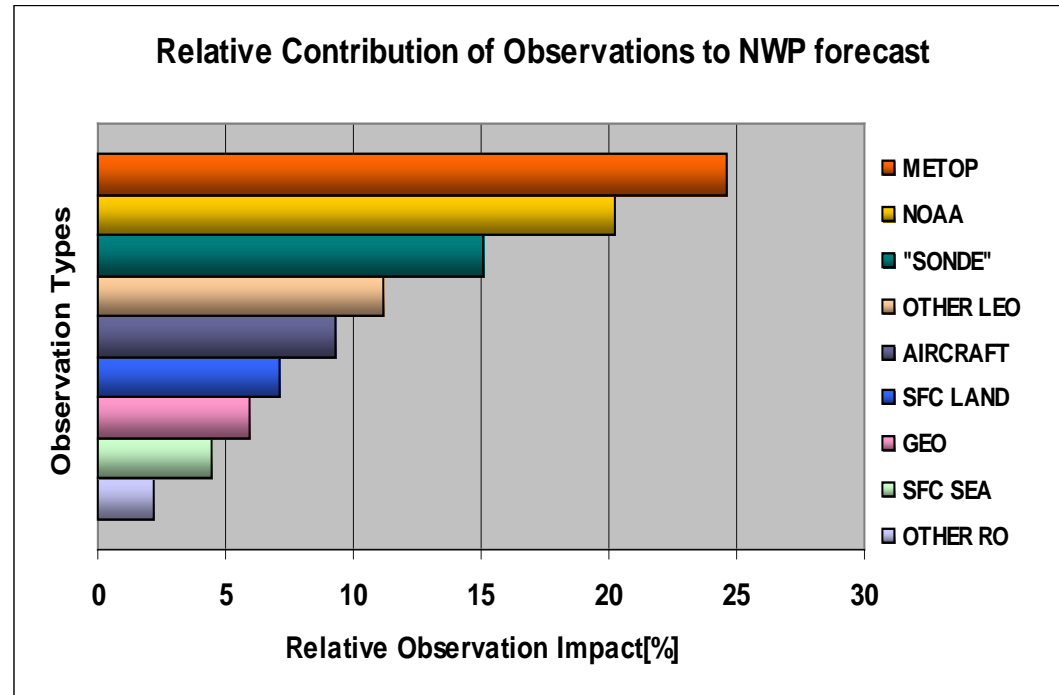
SATELLITE B

- SCAT
- MWI
- ICI
- RO

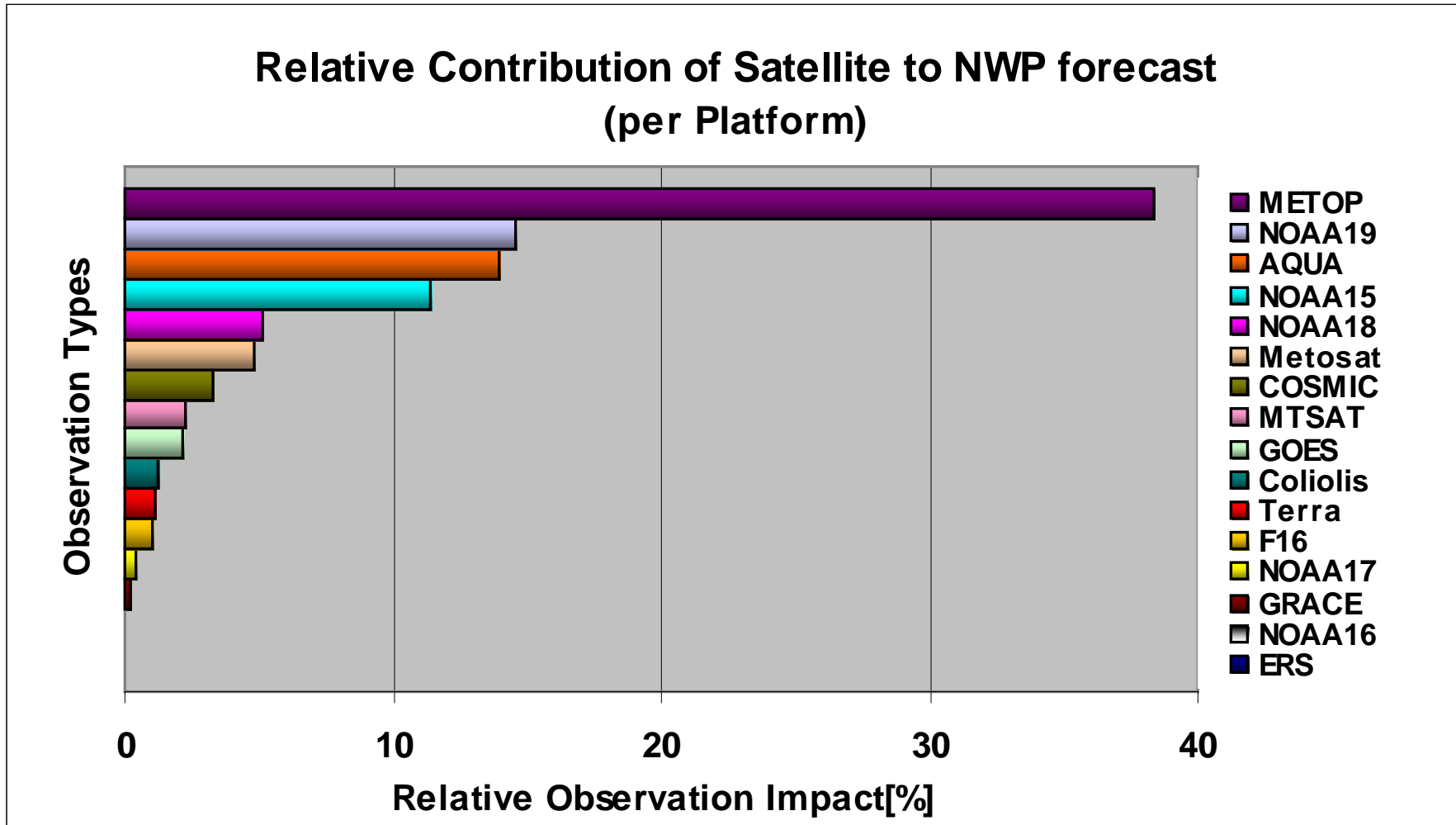


Observation Impacts in Met Office global NWP

- Metop: AMSU-A, MHS, HIRS, IASI, ASCAT, GRAS
- NOAA: AMSU-A: N-15, N-18, N-19
MHS: N-18
HIRS: N-17, N-19
AVHRR AMVs: N-15, N-16, N-17, N-18, N-19
- Other LEO: EOS-Aqua AIRS, MODIS AMVs
EOS-Terra MODIS AMVs
DMSP F-16 SSMIS
ERS-2 AMI; Coriolis WINDSAT
- GEO: GOES AMVs; MTSAT AMVs;
Meteosat AMVs, CLR
- Other RO: CHAMP, GRACE
- Aircraft: AMDAR, AIREP
- “SONDE”: PILOT, TEMP, Wind profiler,
DROPSONDE
- Surface land: SYNOP, BOGUS
- Surface sea: BUOY, SHIP, TCBOGUS

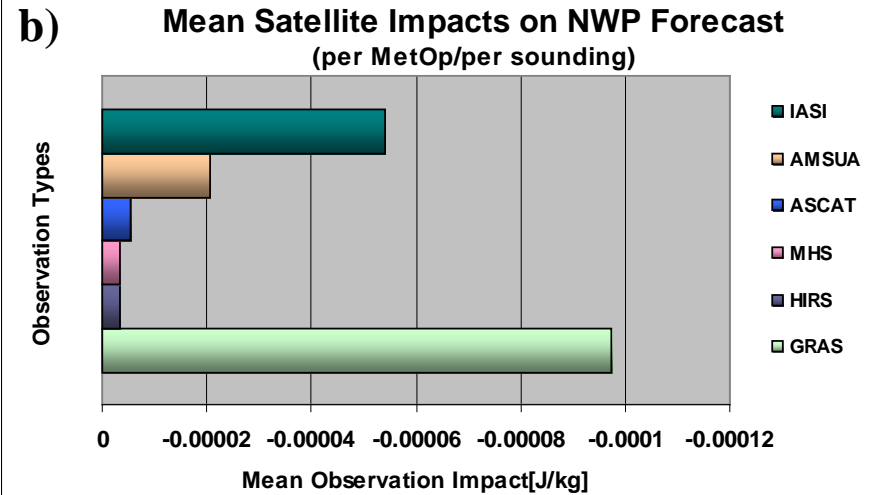
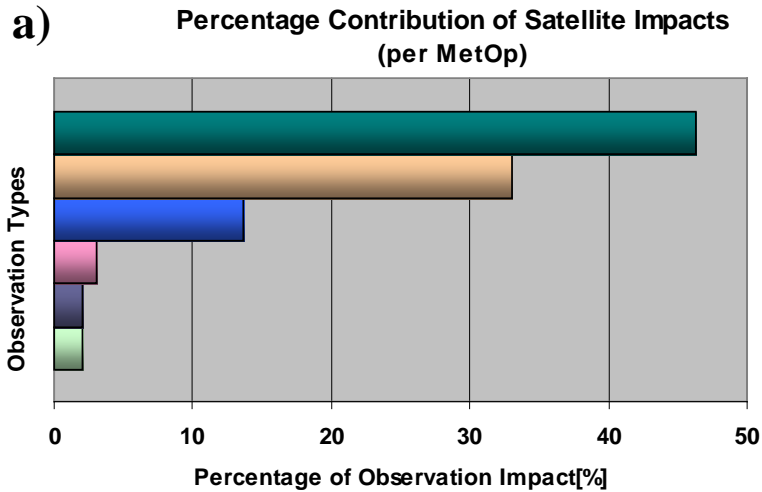


Satellite observation impact per platform





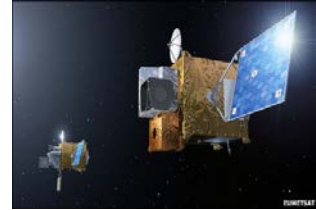
Observation impact per Metop sensor



- AMSU-A: Microwave sounder - temperature
- MHS: Microwave sounder - humidity
- HIRS: Infra-red sounder – temperature and humidity
- IASI: Hyperspectral infra-red sounder – temperature and humidity
- ASCAT: Scatterometer – sea surface wind
- GRAS: Radio occultation sounder – temperature and humidity

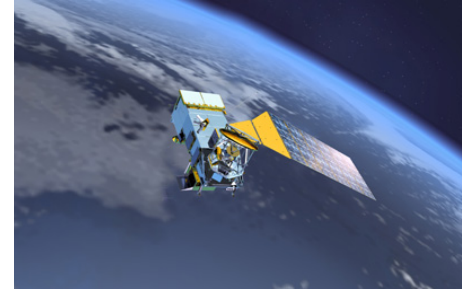
Joo S, Eyre J R and Marriott R T. "The impact of Metop and other satellite data within the Met Office global NWP system, using an adjoint-based sensitivity method". Forecasting Research Technical Report 562, Met Office, UK; 2012.

Future Geostationary Satellites



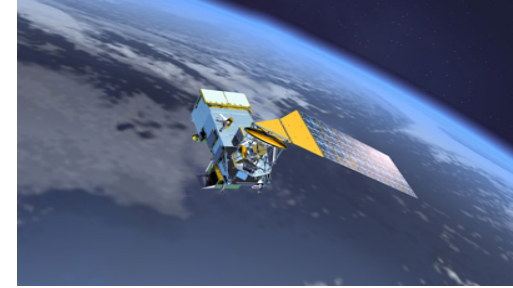
- **EUMETSAT** Meteosat Third Generation Imager and Sounder
 - Launch in 2016/18, six satellites in series, 3 axis stabilised
 - High spectral IR Sounder 700-1210 and 1600-2175cm⁻¹
 - 16 channel VIS+IR Imager (10min scan, 2km fov)
 - Lightning Imager
 - UVNS Sounder for atmospheric chemistry (Sentinel-4)
- **NESDIS** GOES-R Series
 - -R launch in 2015, -S launch in 2017
 - Advanced Imager
 - Lightning Mapper
 - Space Weather instrument suite
 - <http://www.goes-r.gov/> for more details
- **CMA** FY-4 series (IR Sounder, MW Sounder): 2015-2020 launches
- **KMA** COMS-Next for geostationary environmental monitoring
- **ISRO** INSAT-3D to be launched in 2013
- **GeoMetWatch** – Commercial entity, proposed for 2015-2020
 - Advanced Hyperspectral Sounder

Future Polar Satellites



- **ESA: ADM delay to 2015? due to laser reliability**
- **JPSS: JPSS-1 ~2017 launch in PM orbit followed by JPSS-2**
- **GPM: 2014 for precipitation, to replace TRMM**
- **COSMIC-2 GPS-RO**
- **Canada: PCW?**
- **USA/DoD: DWSS to replace DMSP?**
- **EPS-Second Generation to be defined (earlier slide)**
- **ISRO: SARAL (altimeter) scheduled for launch Dec 2012**
- **CMA: FY-3C (2013), FY-3D (2015), FY-3E (2017), FY-3F (2019)**
- **JMA: GCOM-W2, GCOM-C**
- **Iridium?**

Messages for THORPEX



- **Research satellites/instruments can be valuable as operational data providers, but can fail suddenly without backups (e.g. ENVISAT, AMSR-E are recent examples)**
- **Satellite data contributions to the GOS by nations increasing (e.g. FY-3, Oceansat-2), to hopefully help fill future gaps**
- **Contribution of satellite data to the GOS is dominant in many advanced DA systems**
- **Assimilation of full-resolution satellite data in convective scale models is challenging, but progressing**
- **Research underway to extend/improve use of advanced IR sounders (cloudy rads, use PCs, more data over land etc.)**