Extending the Terrestrial Observation and Prediction System (TOPS) to the Suomi NPP Mission

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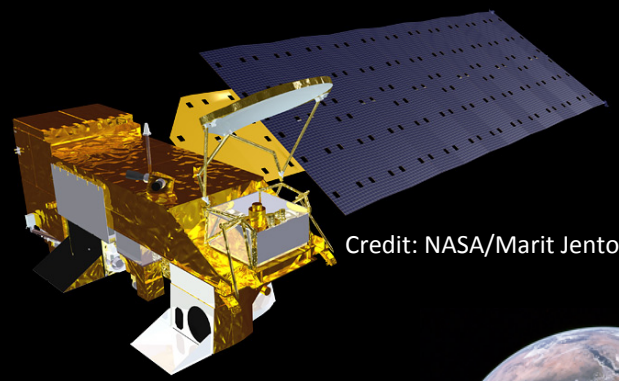
MODIS/VIIRS Transition

Aqua MODIS



Credit: NASA/Marit Jentoft-Nilsen

Credit: NASA/Reto Stöckli

Suomi NPP VIIRS

Credit: NASA/NOAA/GSFC/Suomi NPP/VIIRS/Norman Kuring

MODIS-VIIRS Transition Issues

Spectral characteristics:

- MODIS and VIIRS bands used for land products have similar but not identical spectral characteristics
- Tungsten oxide contamination in VIIRS bands I2 and M7

Spatial characteristics:

- VIIRS has Improved spatial resolution at swath edge
- VIIRS 375m vs. MODIS 250m resolution for vis/NIR bands

Algorithms:

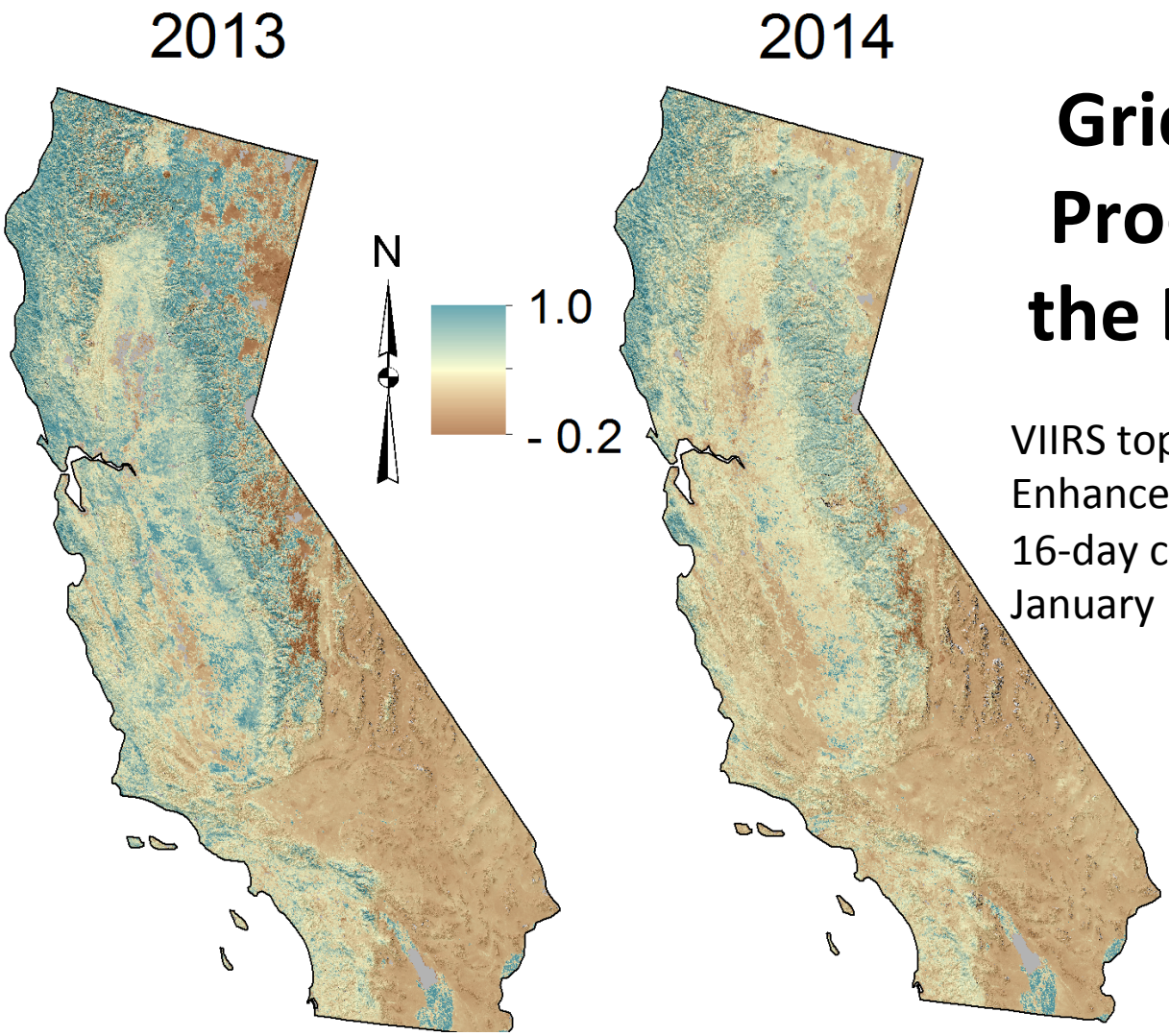
- Different sets of standard products (no TOC NDVI EDR)
- Algorithm changes from MODIS to VIIRS for some standard products
- Different cloud and aerosol filtering
- Different compositing periods
- MODAPS vs. IDPS
- Differences in gridding
- Reprocessing not available from IDPS

Data distribution:

- MODIS data pools vs. NOAA CLASS
- MODIS products in HDF4, VIIRS products in HDF5

VIIRS/MODIS Corresponding Spectral Bands

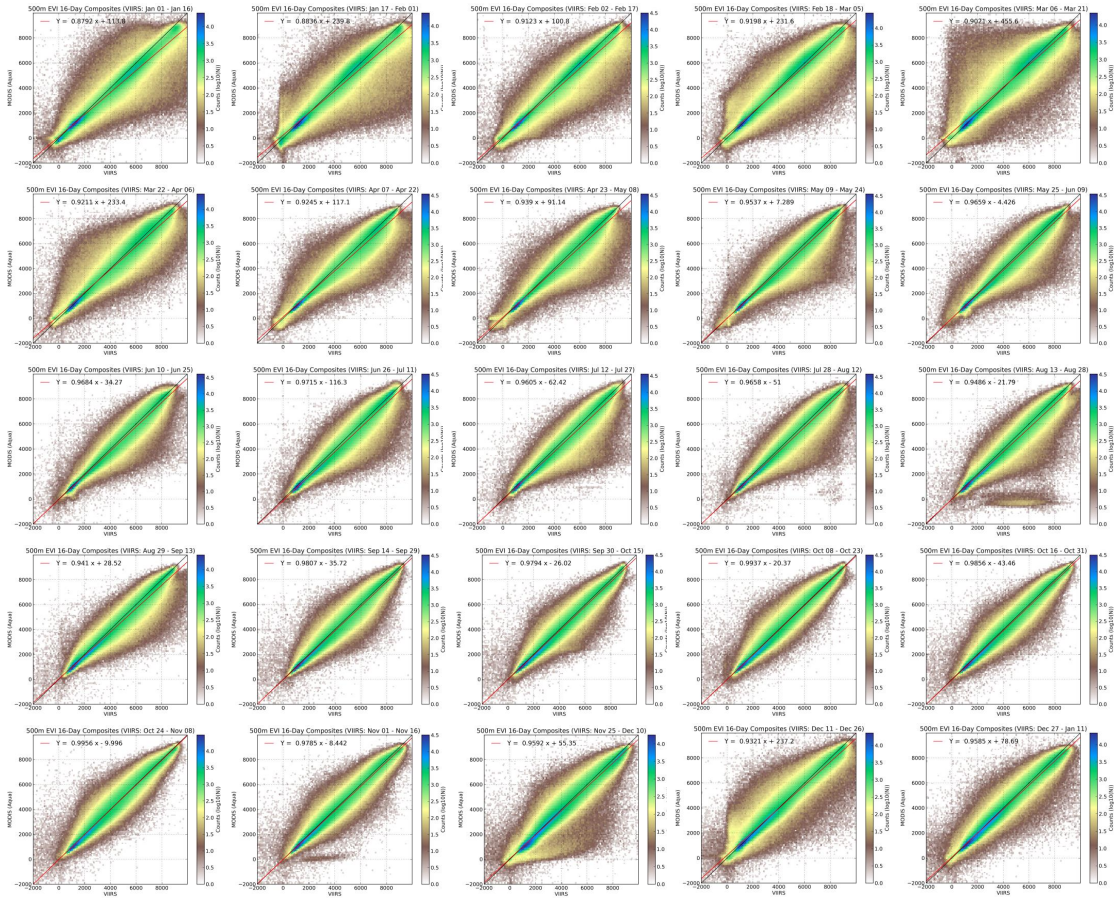
VIIRS Band	Spectral Range (µm)	Nadir HSR (m)	MODIS Band(s)	Spectral Range (µm)	Nadir HSR (m)
DNB	0.500 – 0.900				
M1	0.402 – 0.422	750	8	0.405 – 0.420	1000
M2	0.436 – 0.454	750	9	0.438 – 0.448	1000
M3	0.478 – 0.498	750	3 10	0.459 – 0.479 0.483 – 0.493	500 10000
M4	0.545 – 0.565	750	4 12	0.545 – 0.565 0.546 – 0.556	500 1000
I1	0.600 – 0.680	375	1	0.620 – 0.670	250
M5	0.662 – 0.682	750	13 14	0.662 – 0.672 0.673 – 0.683	1000 1000
M6	0.739 – 0.754	750	15	0.743 – 0.753	1000
I2	0.846 – 0.885	375	2	0.841 – 0.876	250
M7	0.846 – 0.885	750	16 2	0.862 – 0.877 0.841 – 0.876	1000 250
M8	1.230 – 1.250	750	5	SAME	500
M9	1.371 – 1.386	750	26	1.360 – 1.390	1000
I3	1.580 – 1.640	375	6	1.628 – 1.652	500
M10	1.580 – 1.640	750	6	1.628 – 1.652	500
M11	2.225 – 2.275	750	7	2.105 – 2.155	500
I4	3.550 – 3.930	375	20	3.660 – 3.840	1000
M12	3.660 – 3.840	750	20	SAME	1000
M13	3.973 – 4.128	750	21 22	3.929 – 3.989 3.929 – 3.989	1000 1000
M14	8.400 – 8.700	750	29	SAME	1000
M15	10.263 -- 11.263	750	31	10.780 – 11.280	1000
I5	10.500 – 12.400	375	31 32	10.780 – 11.280 11.770 – 12.270	1000 1000
M16	11.538 – 12.488	750	32	11.770 – 12.270	1000

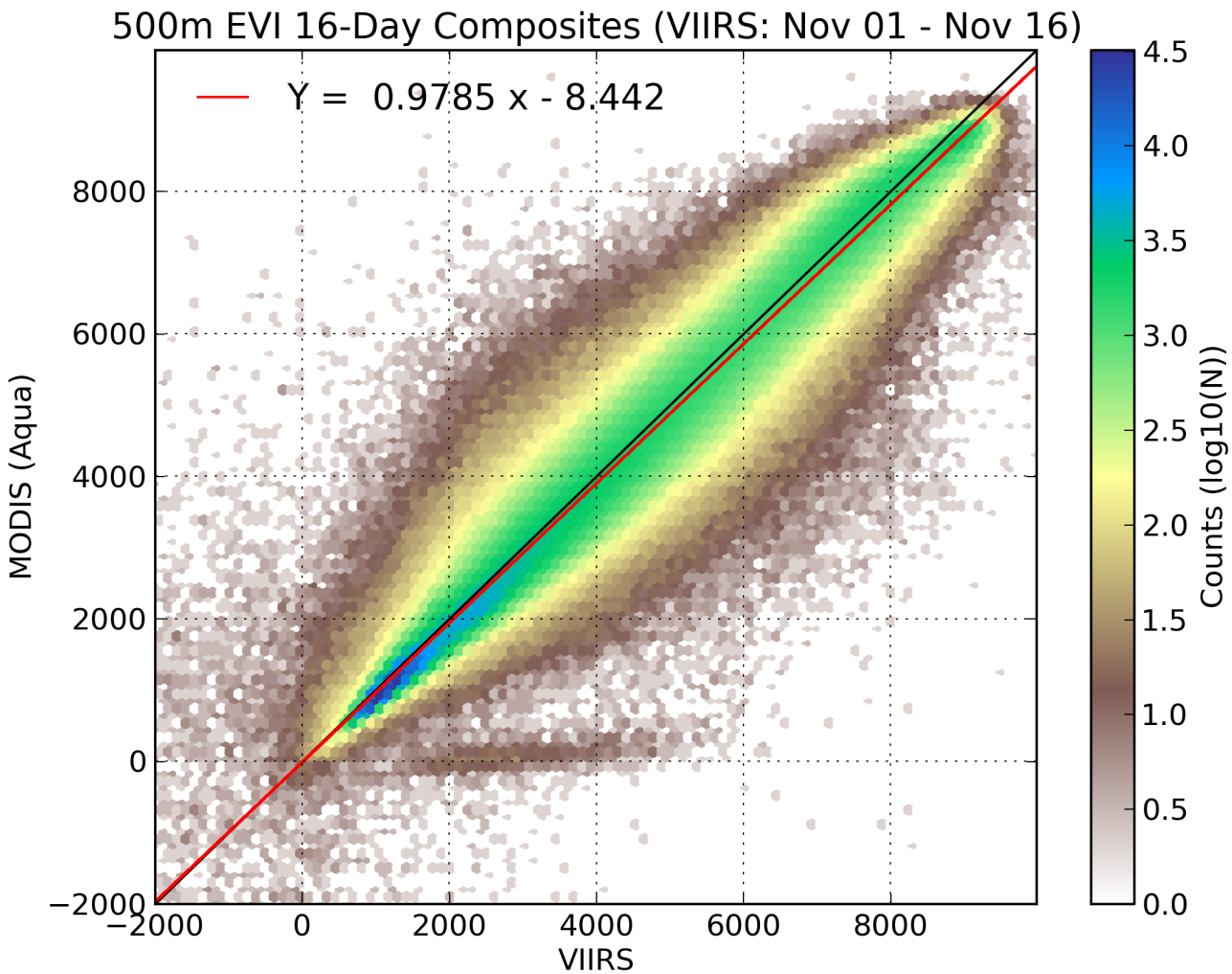


Gridded VIIRS Products from the Land PEATE

VIIRS top-of-canopy "adjusted" Enhanced Vegetation Index (EVI), 16-day composite, first 2 weeks in January

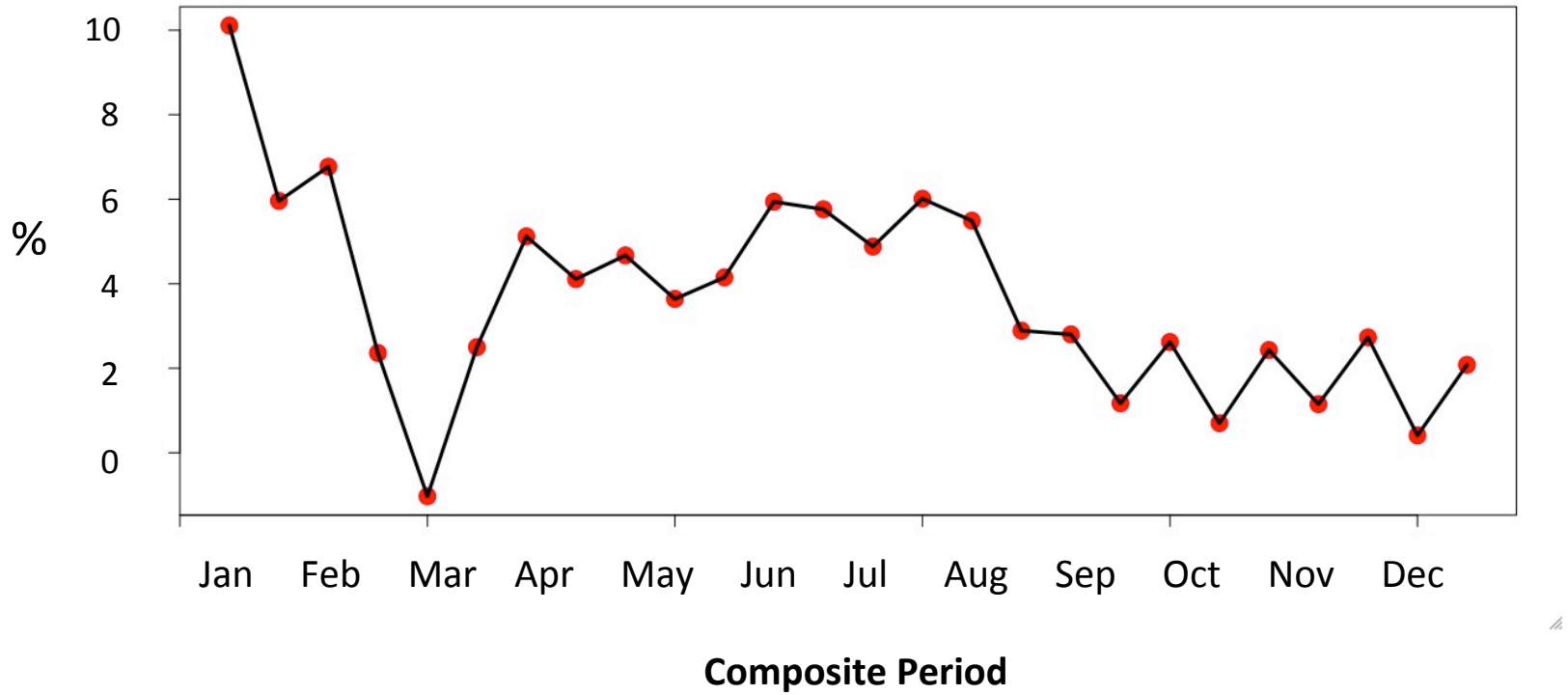
Aqua MODIS EVI vs VIIRS EVI




500m EVI 16-Day Composites (VIIRS: Nov 01 - Nov 16)
Y = 0.9785 x - 8.442
MODIS (Aqua)
VIIRS
−2000
0
2000
4000
6000
8000
Counts (log10(N))
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5

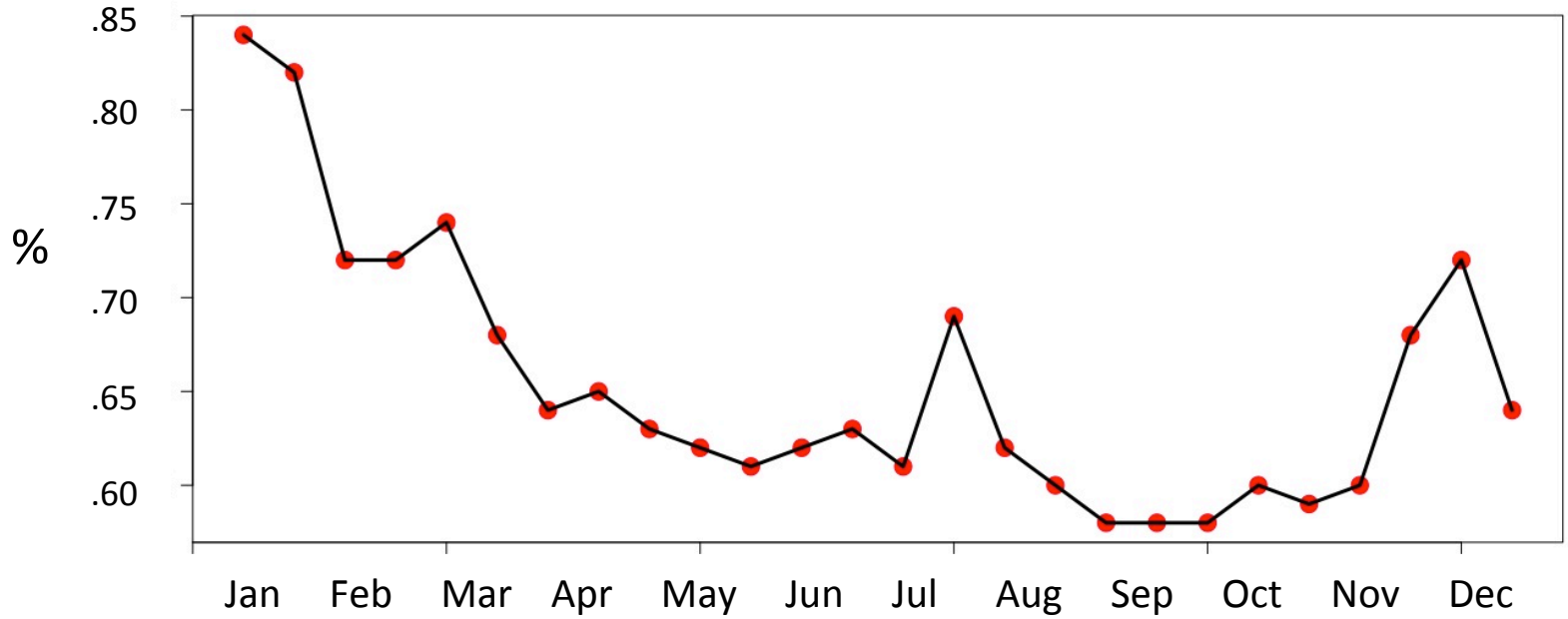
Accuracy

Bias statistics for 500m, 16-day TOC EVI adjusted Land PEATE product relative to Aqua MODIS



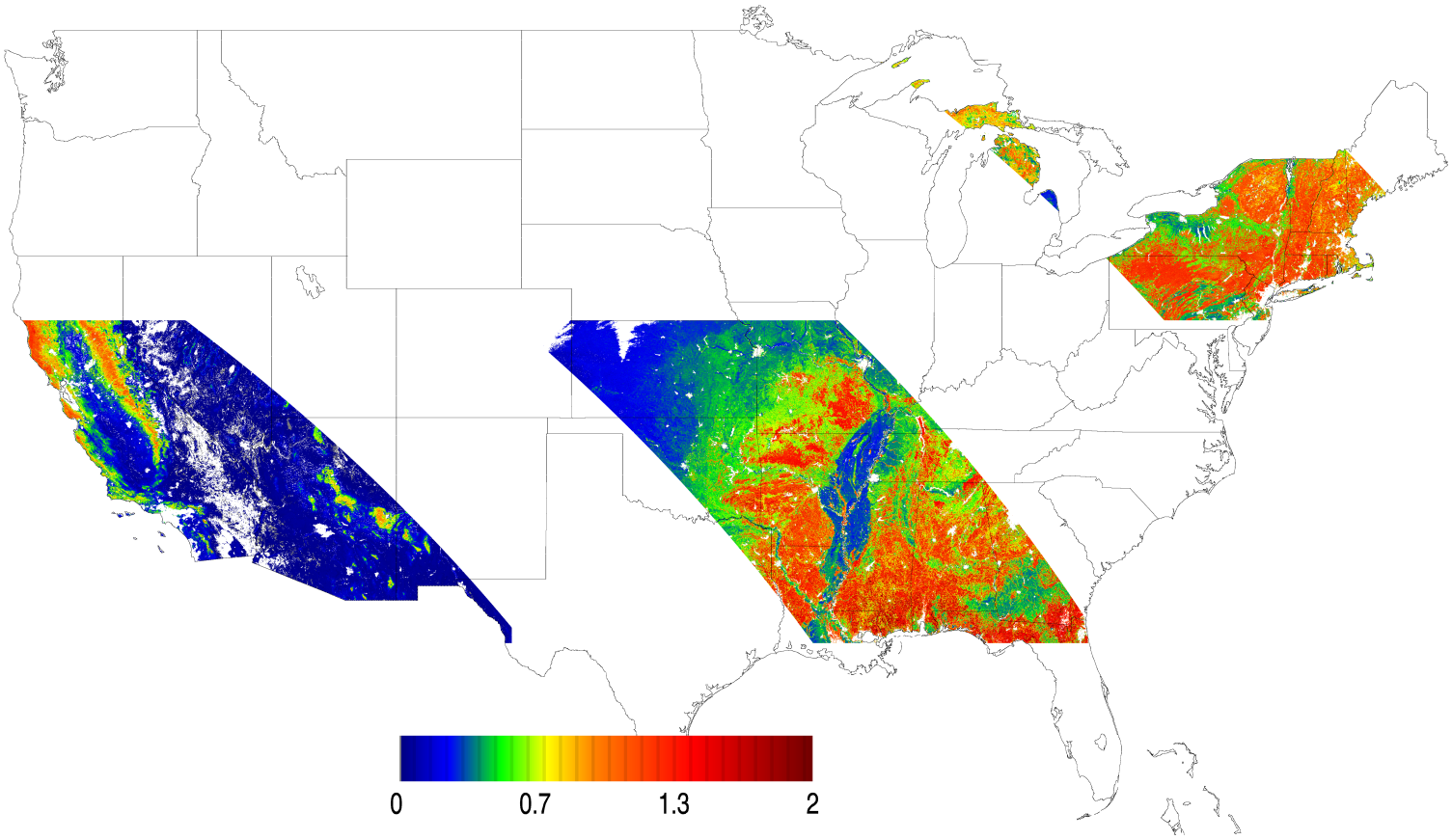
Precision

Precision statistics for 500m, 16-day TOC EVI adjusted Land PEATE product relative to Aqua MODIS

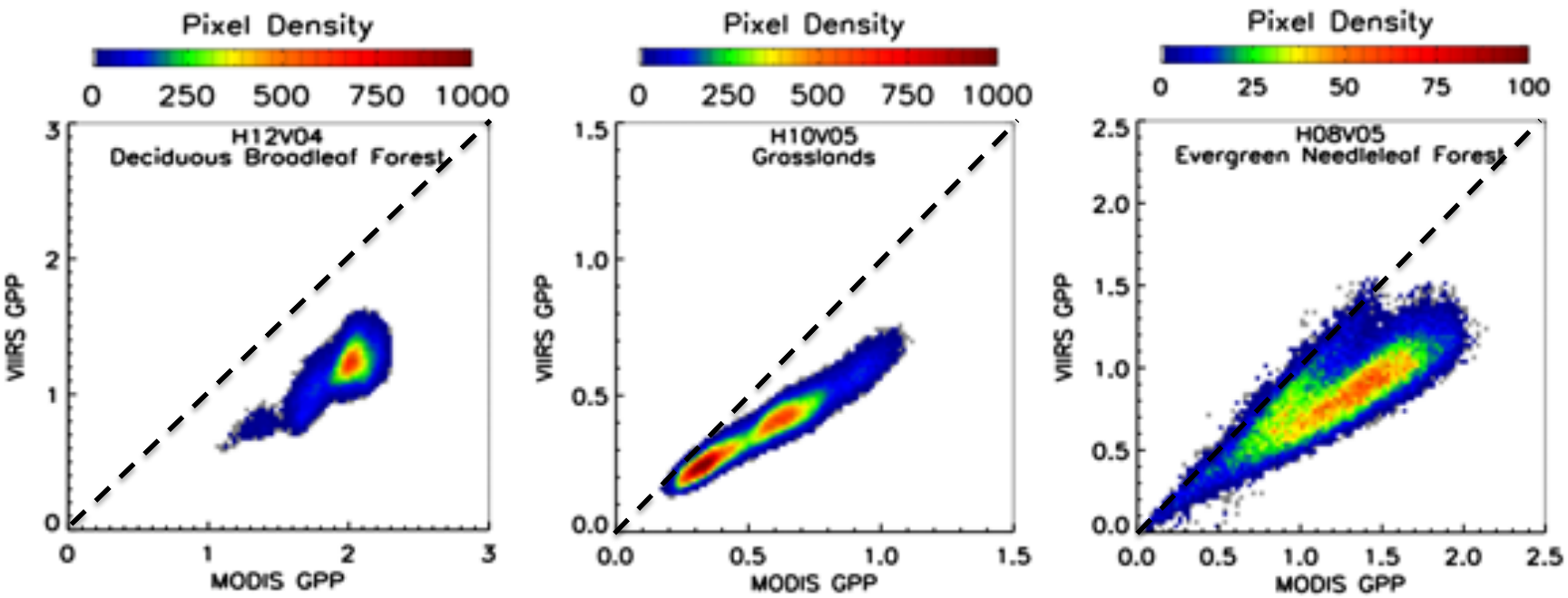


Composite Period

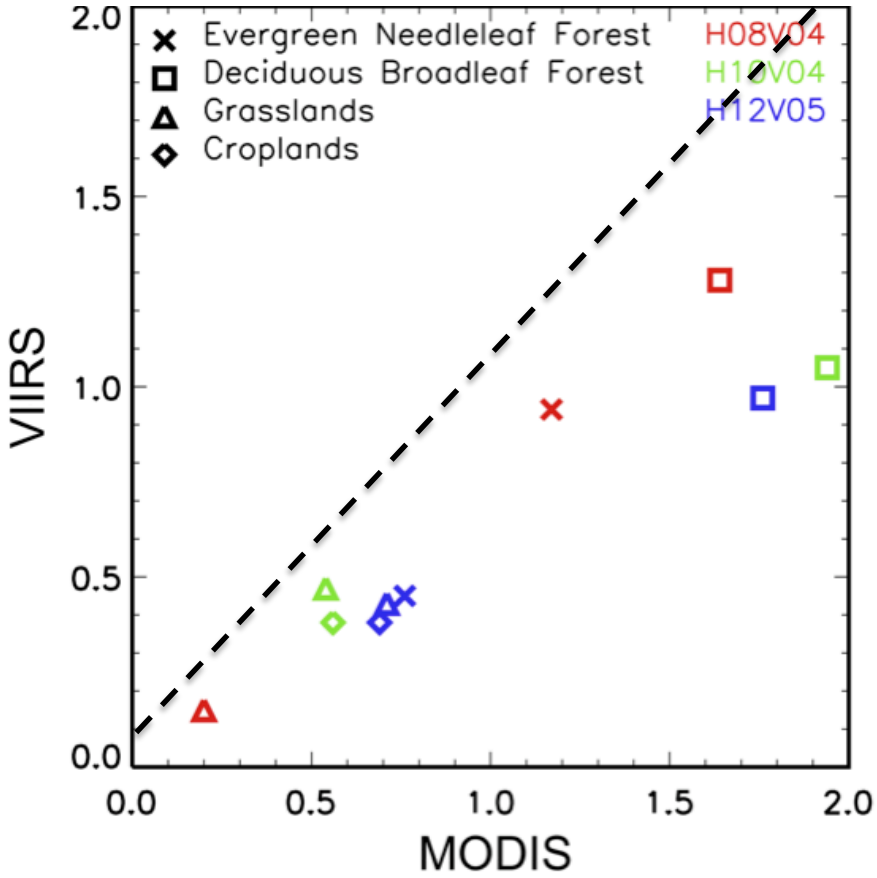
TOPS-Generated GPP (kgC/m^2/year) in 2012



MODIS/VIIRS Comparison for GPP



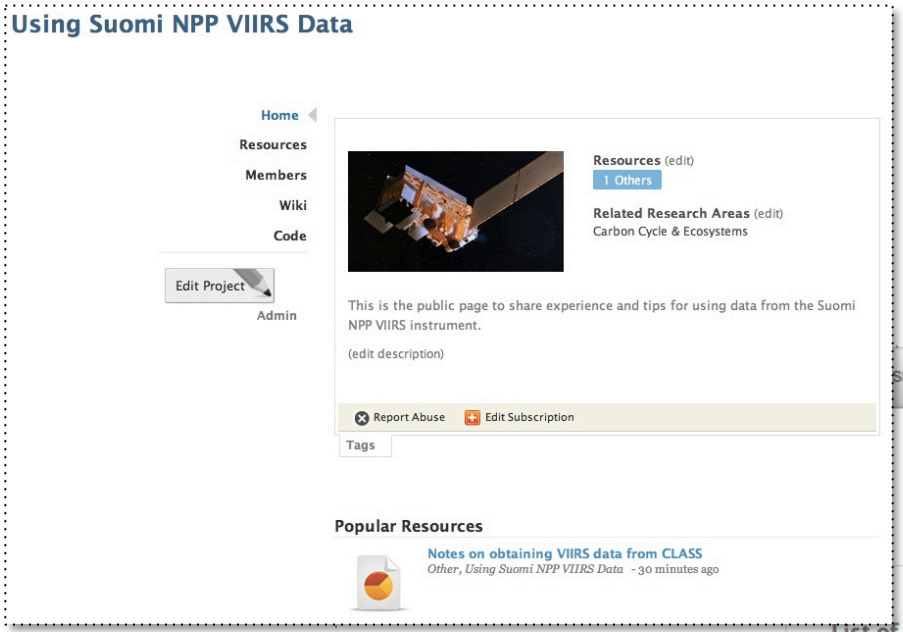
Annual GPP (kg C/m^2/year)



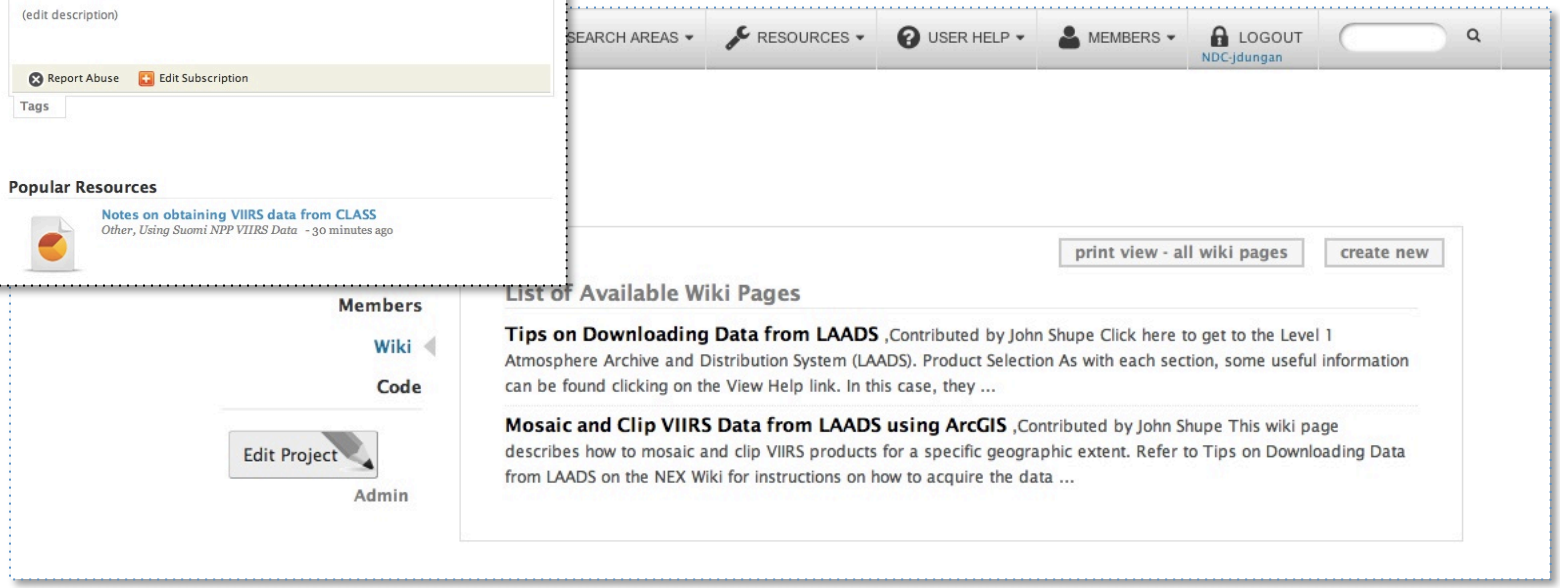
Status of VIIRS Environmental Data Records (EDRs) for (land) Applied Science

- VIIRS data products from NOAA's IDPS are in HDF5 format, problematic for most land applications (including those using TOPS) at least in the near-term
- Readiness status ("beta," "provisional," or "validated") is currently "provisional" for vegetation index EDRs according to NOAA, Feb 2014
- There is no TOC NDVI EDR
- VIIRS products from the Land PEATE are converging with MODIS products and are available in HDF4 from LAADS
- There are no daily or 8-day vegetation index products yet available from LAADS
- Funding from selected ROSES-13 projects will be supporting new SIPS and support to generate MODIS-compatible VIIRS products

Sharing Experience on the NEX Portal



Go to nex.nasa.gov and search for "VIIRS"



Acronyms

ASP – Applied Science Program (NASA)

CLASS – Comprehensive Large Array Data Stewardship System (NOAA)

IDPS – Interface Data Processing Segment (NOAA)

EDR – Environmental Data Record

EVI – Enhanced Vegetation Index

HDF – Hierarchical Data Format

LAADS – Level 1 and Atmosphere Archive and Distribution System (NASA)

MODIS – Moderate Resolution Imaging Spectrometer

NDVI – Normalized Difference Vegetation Index

NEX – NASA Earth Exchange

NPP - National Polar-orbiting Partnership

PEATE – Product Evaluation and Test Element (NASA)

QA – Quality Assurance

SDR – Sensor Data Record

SIPS – Science Investigator-led Processing System(s) (NASA)

TOC – Top-of-Canopy

TOPS – Terrestrial Observation and Prediction System

VIIRS - Visible Infrared Imager Radiometer Suite