

CREATING NEW WAYS TO VIEW LEO SATELLITE OBSERVATIONS OF WINDS AND WAVES

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Cooperative Institute for Meteorological Satellite Studies



Your Authors

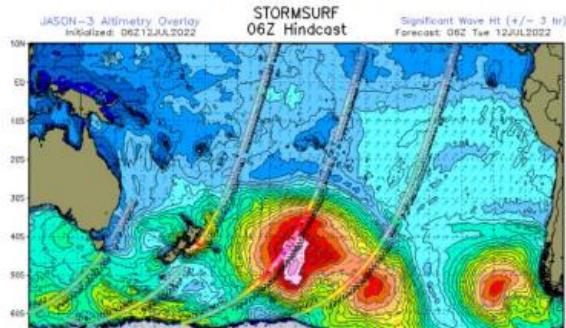


What drove this development?

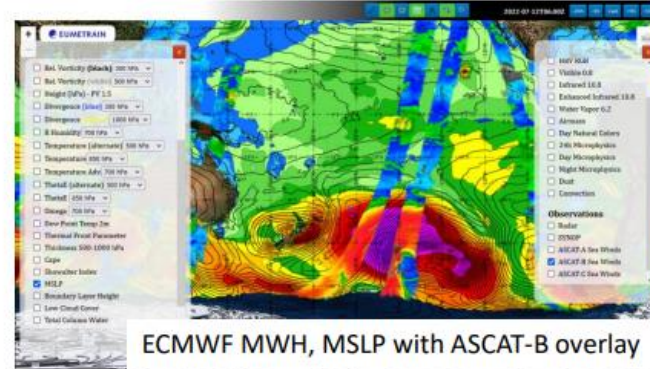
images courtesy EUMETSAT

Surf and Swell event, Pacific Ocean, Original Situation

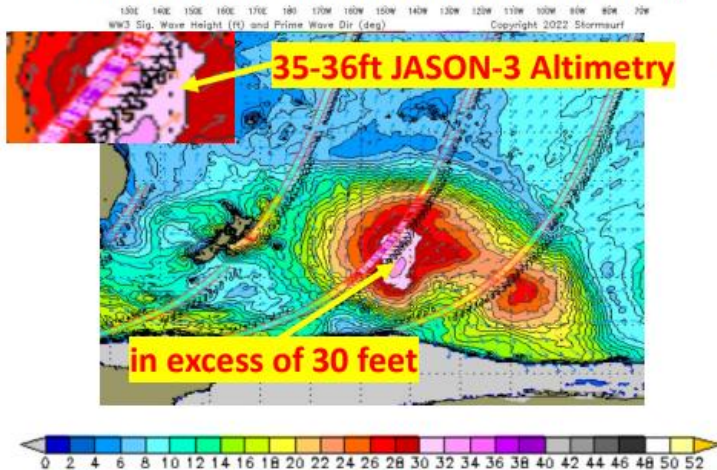
(Various other data, 06UTC 12th July 2022, Stormsurf and EUMETRAN MapViewer)



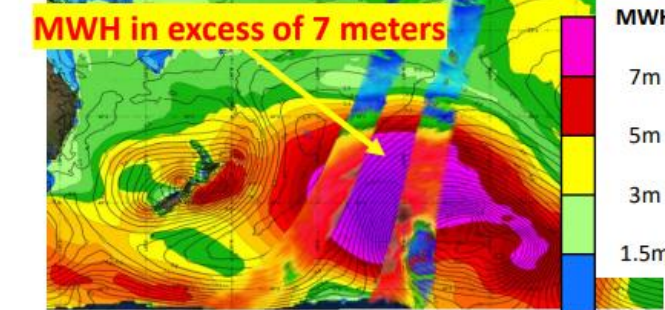
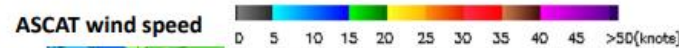
NOAA Wavewatch III with JASON-3 Altimetry overlay



ECMWF MWH, MSLP with ASCAT-B overlay



Significant Wave Height (ft)



MSLP, Maximum Wave Height (MWH) and ASCAT wind speed

images from Stormsurf

Images from EUMETRAN

I found it very hard to monitor the progression of waves with just snapshots at the manati website

([Manati website](#))

So much data at this website

STAR Ocean Surface Winds Team

<https://manati.star.nesdis.noaa.gov/>

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▶ Product Description

▶ Data Products

- ▶ QuikSCAT/SeaWinds
- ▶ OSCAT
- ▶ RapidSCAT
- ▶ ASCAT (METOP-A)
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- ▶ SSM/I
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W3C HTML 4.01 ✓ W3C WAI-A WCAG 1.0

Ocean Surface Winds Team

Ocean Surface Winds Team

The ocean comprises over 70% of Earth's surface, which makes satellite remote sensing a logical and significant component of an overall effort to meet societal needs for weather and water information; support commerce with information for safe, efficient, and environmentally sound transportation; and provide information for better coastal preparedness. Ocean surface vector winds (OSVW) are crucial pieces of information needed to understand and predict the short-term and longer-term processes that drive our planet's environment. As the largest source of momentum for the ocean surface, winds affect the full range of ocean movement, from individual surface waves to complete current systems. Winds along the ocean surface regulate interaction between the atmosphere and the ocean via modulation of air-sea exchanges of heat, moisture, gases, and particulates. With the ocean covering almost three quarters of Earth's surface, this interaction has significant influence on global and regional climate.

The Ocean Surface Winds Team (OSWT) of the Center for Satellite Application and Research (STAR), NESDIS/NOAA applies remotely-sensed data received from operational and research satellites. OSWST mission objectives include:

- ▶ Product development and improvement
- ▶ Calibration and validation
- ▶ OSVW field experiment program
 - ▶ Product development
 - ▶ Calibration and validation
 - ▶ Future mission risk reduction
- ▶ User support (education, training and feedback)
- ▶ Support future mission planning and development

Given the wave event I was interested in the altimetric observations



Altimetric Significant Wave Height

Altimeter Data Products

https://manati.star.nesdis.noaa.gov/datasets/SGWHDData.php

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STAR Center for Satellite Applications and Research
National Environmental Satellite, Data, and Information Service (NESDIS)

Ocean Surface Winds Team.

Additional Products: Significant Wave Height | Year: 2022 | Month: 10 | Day: 31

100a(80N80S-180E180W)

Choose a date, and then click on a location

SIGNIFICANT WAVE HEIGHT

04:00 10/31/22 - 16:00 10/31/22
12 hour collection of altimeter wave heights
(created: Oct 31 16:50:14 UTC 2022)

3 6 9 12 15 18 21 24 27 30 33 36 39 42 45 70 (ft)

30 45 60 75 90 105 120 135 150 165 180 -185 -150 -135 -120 -105 -90 -75 -60 -45 -30 -15 0 15 30

80 70 60 50 40 30 20 10 0 -10 -20 -30 -40 -50 -60 -70 -80

30 45 60 75 90 105 120 135 150 165 180 -185 -150 -135 -120 -105 -90 -75 -60 -45 -30 -15 0 15 30

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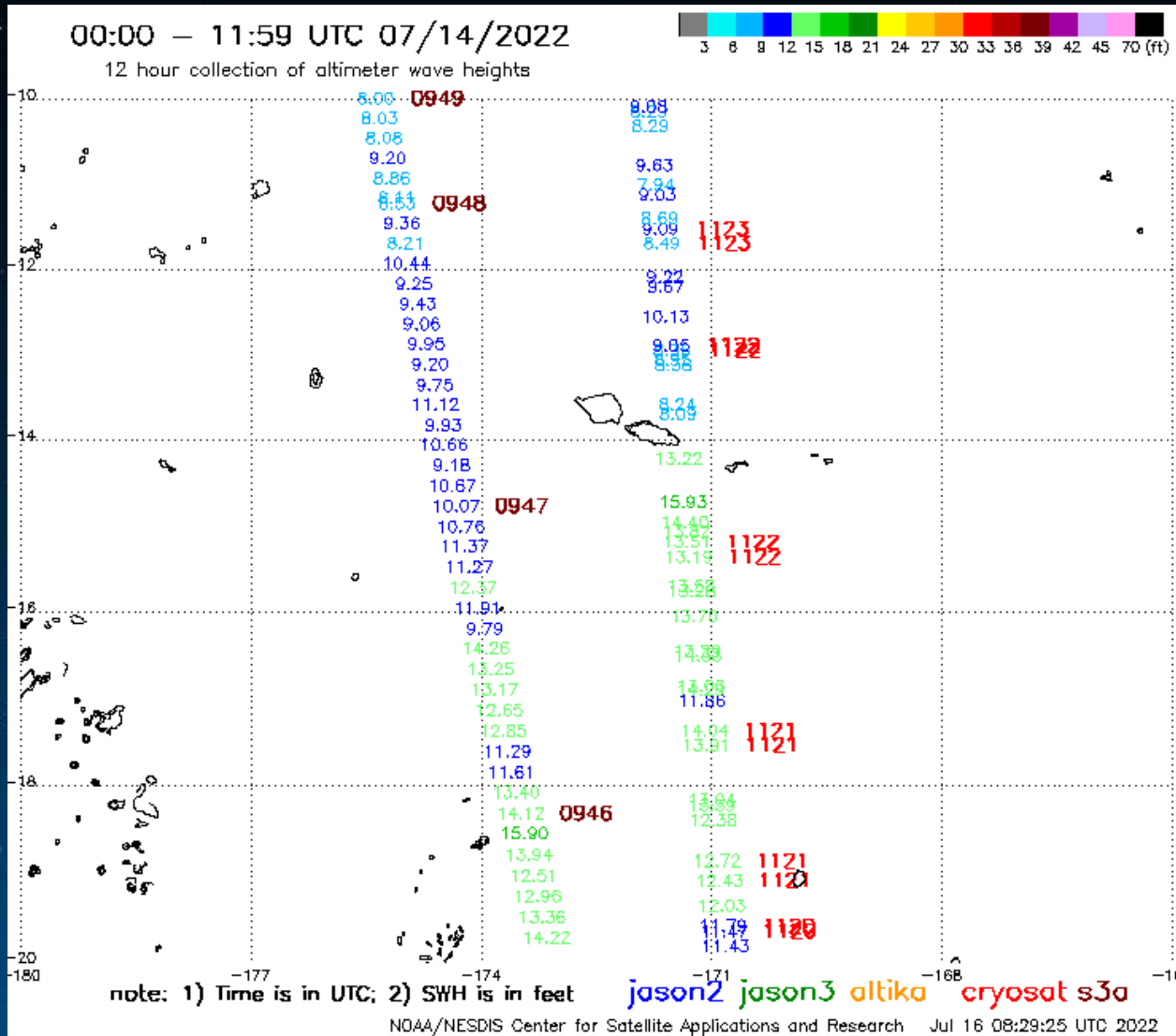
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Imagery from 14 July 2022

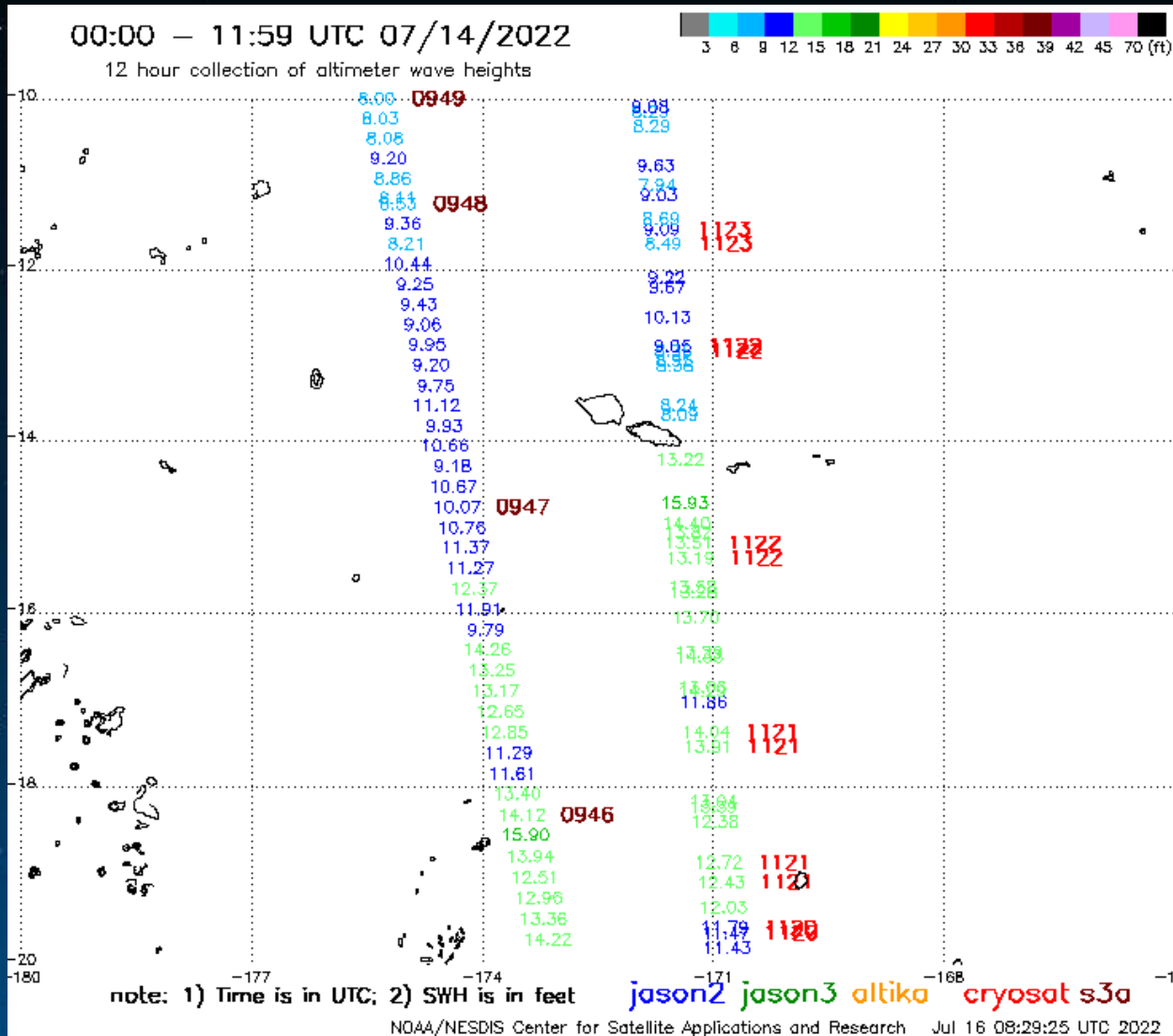
https://manati.star.nesdis.noaa.gov/rscat_images/sgwh/sgwh_wh_arch/WH2022195/zooms/WMB7_00.png



What I don't like: I see one domain, and only at one time.

Imagery from 14 July 2022

https://manati.star.nesdis.noaa.gov/rscat_images/sgwh/sgwh_wh_arch/WH2022195/zooms/WMB7_00.png



Note the url – this website is scrape-able as it turns out – that is, the unix command *wget* can be used.

And there is an image with observations from 12:00 – 23:59 UTC (_00 is replaced by _12 in the url)

The '7' in the url – *WMB7_00.png* – is unique to this specific domain

Plan: Make a job that can be called by cron daily

- Get imagery from more than one day – I chose a week
- Create the urls for the specific domain centered on American Samoa – and also the 9 (3x3) domains surrounding it. For the last 7 days

282	6	18
283	7	19
284	8	20

- Do the same for Guam (3x4), and for Hawaii (3x3)

243	255	267	279	2	14	26
244	256	268	280	3	15	27
245	257	269	281	4	16	28

Get the images for these domains, paste them together

<https://www.ssec.wisc.edu/~scottl/Waveheight/PacificRegionWaves.html>

- **The website above includes links to three separate domains – centered on Guam, American Samoa and Hawaii – that yield week-long animations of the Altimetric wave heights**
- **Also include links to training on altimetry!**

HAnis allows automatic updating of imagery as long as you follow the same naming conventions – that is, image1 – image7 (each time) vs. image20221021 – image20211028 (with values that change each day)


Get the images for these domains, paste them together

<https://www.ssec.wisc.edu/~scottl/Waveheight/PacificRegionWaves.html>

JASON WaveHeights over Pacific Region Waves

<https://www.ssec.wisc.edu/~scottl/Waveheight/PacificRegionWaves.html>

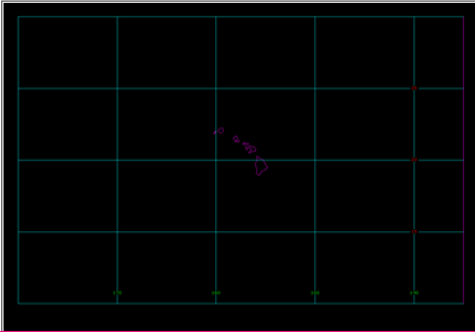
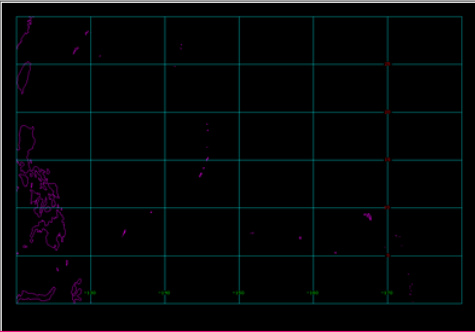
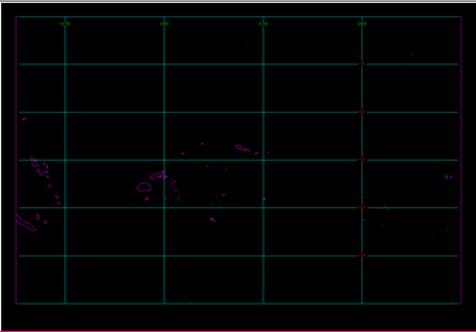
110%



This website shows animations using data from this [NOAA/STAR website](#).

Seven days' worth of data over various sectors are pasted together for the animations.

Click on 'Sector centered on xxxx' to view data in the desired location

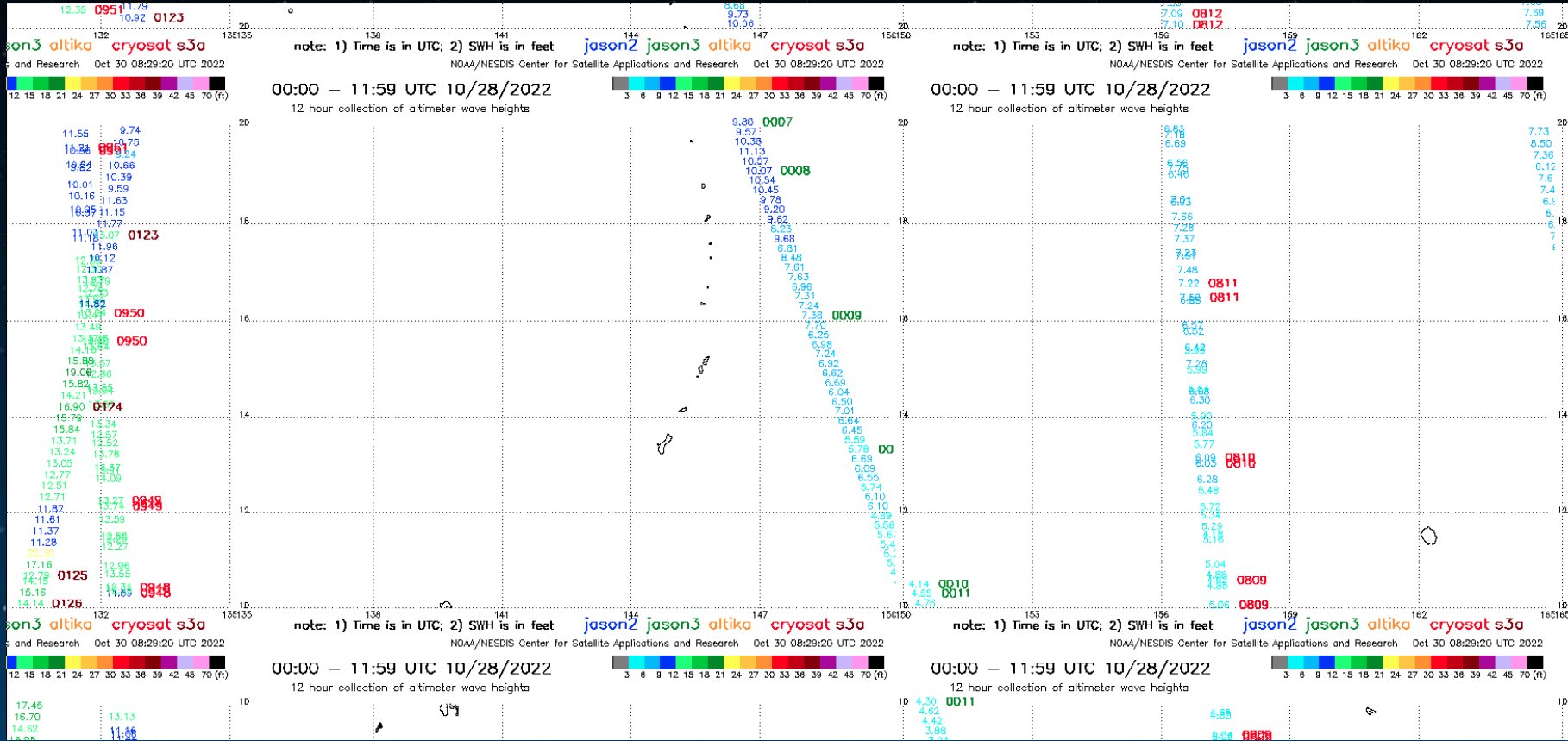
		
Sector centered on Hawaii	Sector centered on Guam	Sector centered on American Samoa
Here's a Quick Guide on Jason Waveheight	A Quick Training video on Jason Waveheight	There is COMET MetEd training on JASON too!

[and Here's a poem for you about the winter solstice](#)

For questions about this website, please contact Scott Lindstrom at either UW-Madison SSEC or NOAA. Google can find me.

Get the images for these domains, paste them together

<https://www.ssec.wisc.edu/~scottl/Waveheight/PacificRegionWaves.html>



Once the waves were done...

- **Why not do something similar for winds?**
- **ASCAT from MetopB and MetopC are available**
 - Similar domains to Significant Wave Height
 - MetopB and MetopC are similar swaths – overlay them
- **AMSR-2 Wind Speeds are available**
 - Sector sizes are larger than ASCAT sectors

So much data at this website

The screenshot shows a web browser window with the URL <https://manati.star.nesdis.noaa.gov/>. The page header includes the STAR logo and the text "Center for Satellite Applications and Research" and "National Environmental Satellite, Data, and Information Service (NESDIS)". The main navigation bar contains links for "OSWT Home", "Product Description", "Data Products", "Research", and "Contact Us". The "Data Products" menu is expanded, showing a list of products: QuikSCAT/SeaWinds, OSCAT, RapidSCAT, ASCAT (METOP-A), ASCAT (METOP-B), ASCAT (METOP-C), WindSAT, Altimeter, SMAP, ERS-2, SSM/I, GCOMW1/AMSR2, CYGNSS, SCATSAT, Aircraft Data, and ICE PRODUCTS. Two red arrows point to "ASCAT (METOP-B)" and "GCOMW1/AMSR2". The main content area is titled "Ocean Surface Winds Team" and contains a paragraph of text about the team's mission and a list of objectives. The footer includes a search bar, a timestamp "Last modified on December 22, 2016 7:12 PM", and various certification logos like W3C, HTML 4.01, and WAI-A WCAG 1.0.

STAR Center for Satellite Applications and Research
National Environmental Satellite, Data, and Information Service (NESDIS)

Ocean Surface Winds Team.

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OSWT Home >>

Product Description

Data Products

- QuikSCAT/SeaWinds
- OSCAT
- RapidSCAT
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- SCATSAT
- Aircraft Data
- ICE PRODUCTS

Research

Contact Us

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Search

MetopB

The Advanced Scatterometer (AS x +)

https://manati.star.nesdis.noaa.gov/datasets/ASCATBData.php

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OSWT Home

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Ocean Surface Winds Team.

STAR Center for Satellite Applications and Research
National Environmental Satellite, Data, and Information Service (NESDIS)

Data from Satellite/Instruments: **Advanced Scatterometer (ASCAT METOP-B)**

Additional Products: NOAA wind vectors 10x15 (25) | Year: 2022 | Month: 11 | Day: 1 | | Global(80N80S-180E180W)

Ascending Pass

ASCAT-B 25KM NOAA Winds 20221031 ascending

0 5 10 15 20 25 30 35 40 45 >5D(knots)

Descending Pass

ASCAT-B 25KM NOAA Winds 20221031 descending

MetopC

The Advanced Scatterometer (AS x +)

https://manati.star.nesdis.noaa.gov/datasets/ASCATCData.php

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OSWT Home

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- GCOMW1/AMSR2
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Ocean Surface Winds Team.

STAR Center for Satellite Applications and Research
National Environmental Satellite, Data, and Information Service (NESDIS)

Data from Satellite/Instruments: **Advanced Scatterometer (ASCAT METOP-C)**

Additional Products: NOAA wind vectors 10x15 (25) | Year: 2022 | Month: 11 | Day: 1 | | Global(80N80S-180E180W)

Ascending Pass

ASCAT-C 25KM NOAA Winds 20221031 ascending

0 5 10 15 20 25 30 35 40 45 >5D(knots)

Descending Pass

ASCAT-C 25KM NOAA Winds 20221031 descending

AMSR2

The GCOM Data Products

https://manati.star.nesdis.noaa.gov/datasets/GCOM2Data.php

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OSWT Home

Product Description

Data Products

- QuikSCAT/SeaWinds
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- RapidSCAT
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- ASCAT (METOP-B)
- ASCAT (METOP-C)
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- Altimeter
- SMAP
- ERS-2
- SSM/I
- GCOMW1/AMSR2 >>**
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Ocean Surface Winds Team.

STAR Center for Satellite Applications and Research
National Environmental Satellite, Data, and Information Service (NESDIS)

Data from Satellite/Instruments: [GCOMW1-AMSR2 Radiometer](#)

Additional Products: Wind Speed

Year: 2022

Month: 11

Day: 1

Global(80N80S-180E180W)

Ascending Pass

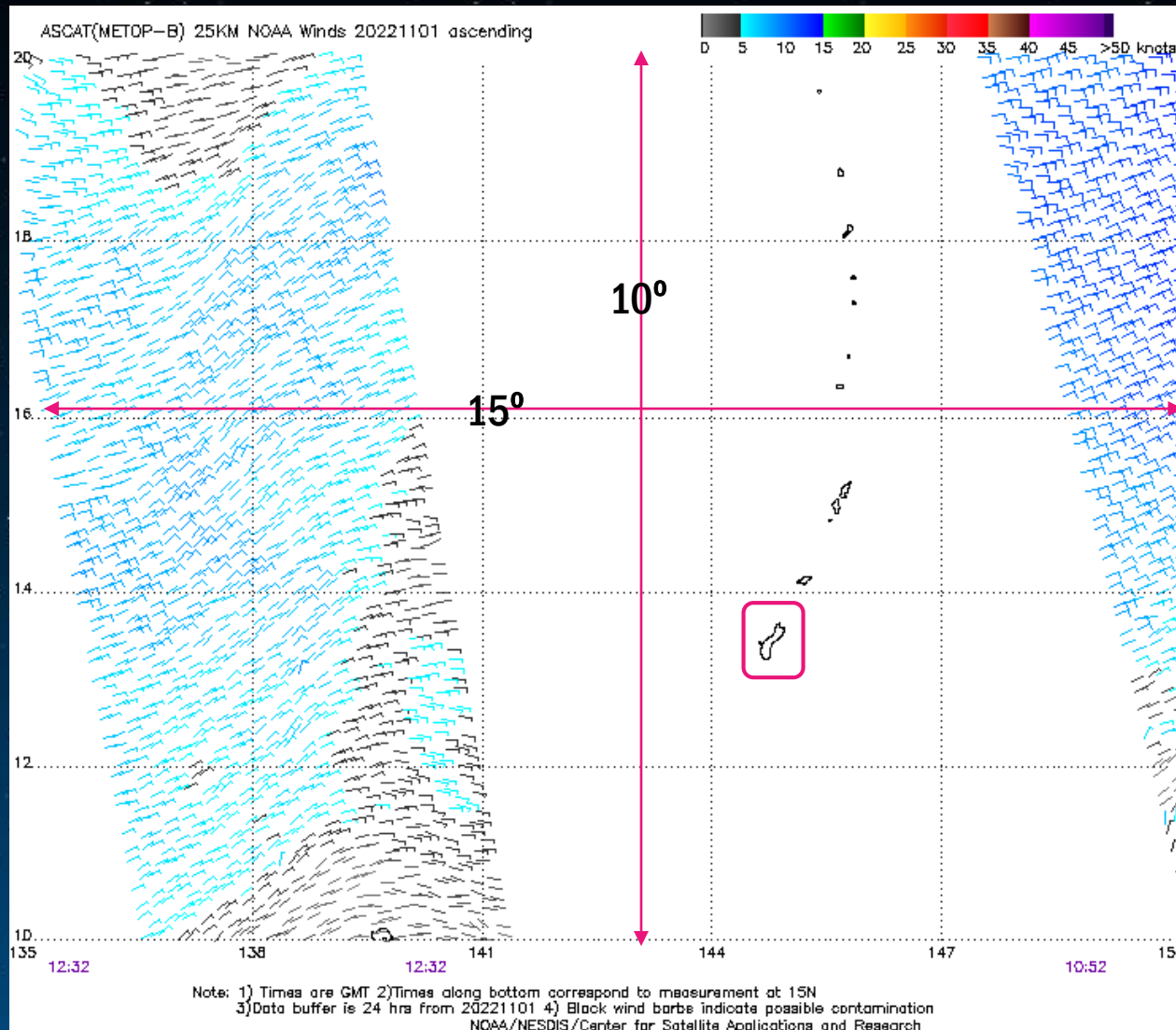
AMSR2 NRT Winds 20221031 ascending

Descending Pass

AMSR2 NRT Winds 20221031 descending

Click near Guam

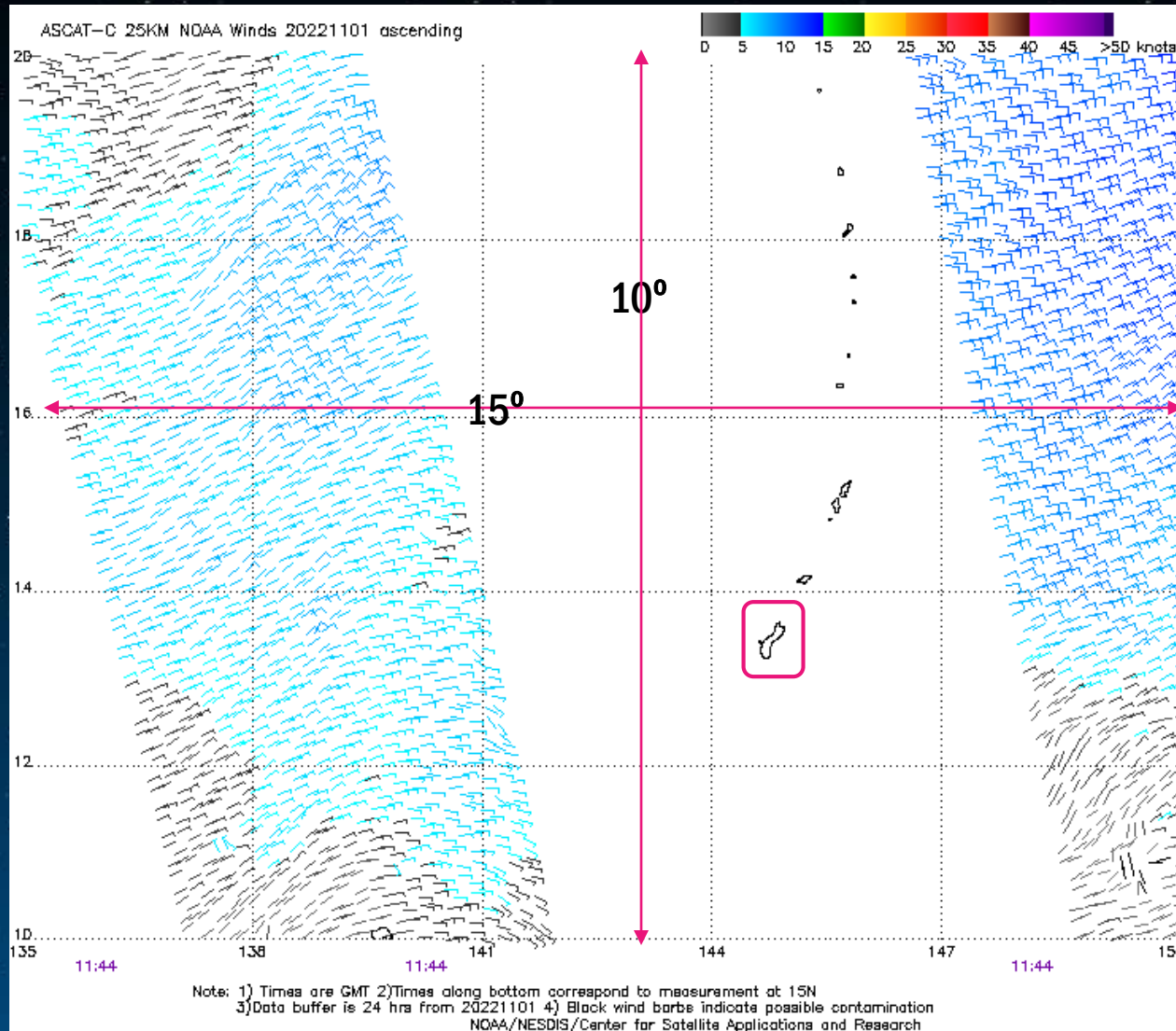
https://manati.star.nesdis.noaa.gov/ascat_images/day_25km_METB/zooms/WMBas256.png



ASCAT from
MetopB

Click near Guam

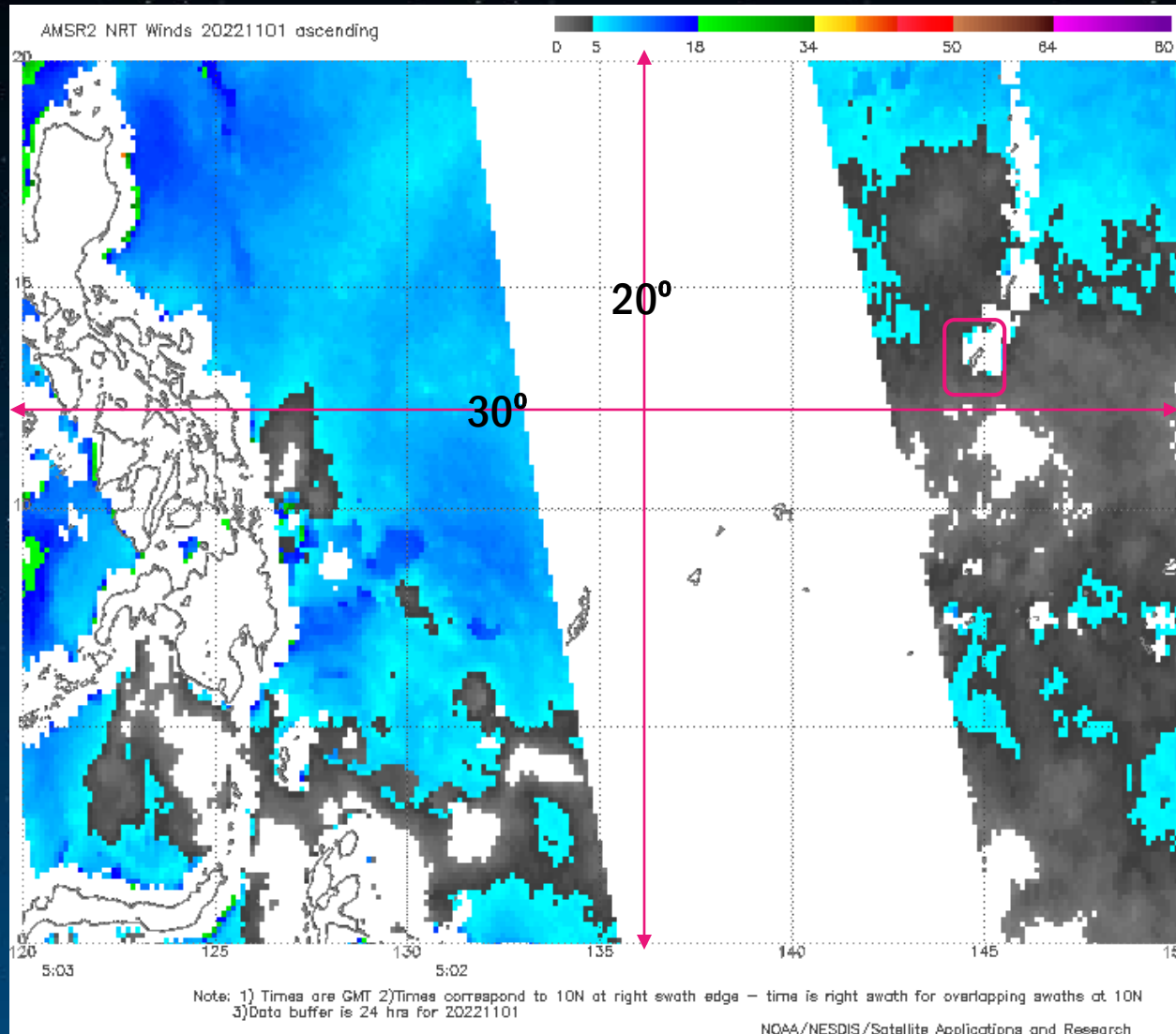
https://manati.star.nesdis.noaa.gov/ascat_images/day_25km_METC/zooms/WMBas256.png



ASCAT from
MetopC

Click near Guam

https://manati.star.nesdis.noaa.gov/gcom_images/arch/wdsp/GC2022305/zooms/WMBas62.png




AMSR-2
winds from
GCOM-W1

Website for ASCAT winds

<https://www.ssec.wisc.edu/~scottl/Windspeed/PacificRegionWinds.html>

ASCAT Winds over Pacific Regio X

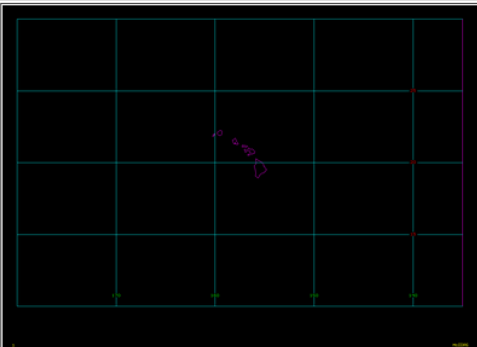
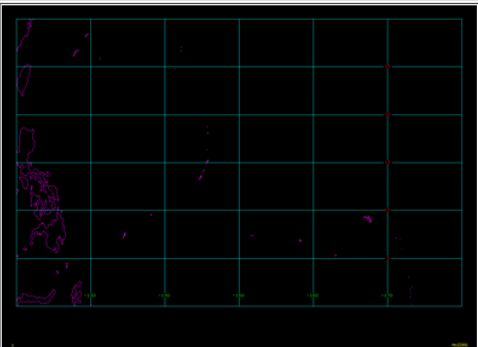
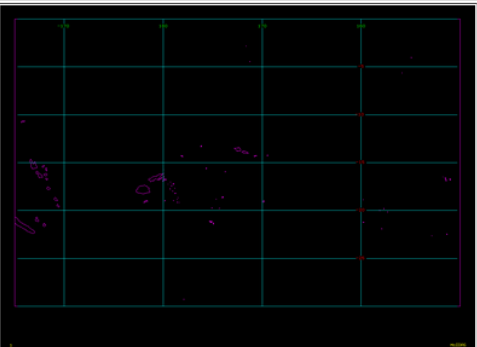
← → ↻ 🔒 https://www.ssec.wisc.edu/~scottl/Windspeed/PacificRegionWinds.html 110% ☆ 📄 ⌵



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Seven days' worth of data over various sectors are pasted together for the animations.

Click on 'Sector centered on xxxx' to view data in the desired location

		
Sector centered on Hawaii	Sector centered on Guam	Sector centered on American Samoa
COMET Training on ASCAT	NOAA's website on ASCAT	EUMETSAT information on ASCAT

[and Here's a poem for you about the winter solstice](#)


For questions about this website, please contact Scott Lindstrom at either UW-Madison SSEC or NOAA. Google can find me.

Website for AMSR2 winds

<https://www.ssec.wisc.edu/~aross/Windspeed/PacificRegionWinds.html>

AMSR2 Winds over Pacific Region

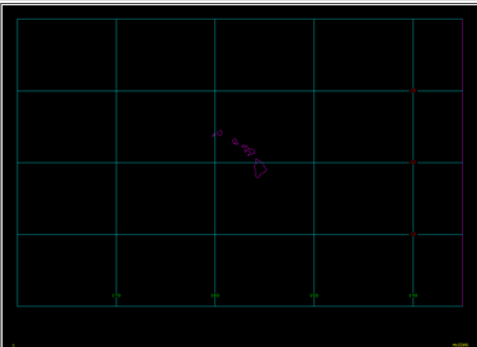
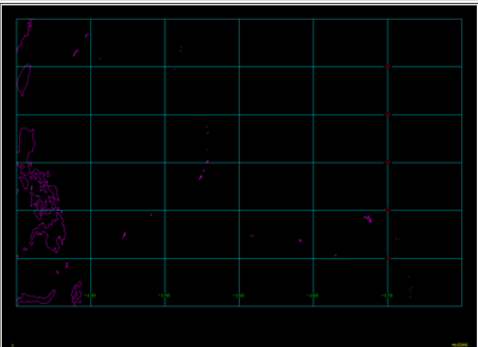
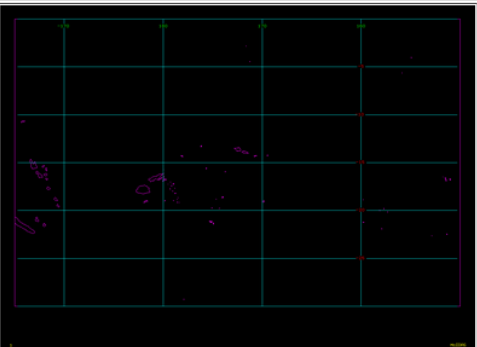
<https://www.ssec.wisc.edu/~aross/Windspeed/PacificRegionWinds.html>



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Click on 'Sector centered on xxxx' to view data in the desired location

		
Sector centered on Hawaii	Sector centered on Guam	Sector centered on American Samoa
CIMSS Quick Guide on GCOM AMSR2 Winds	NOAA's website on GCOM AMSR2 Winds	NASA Information on AMSR2 Winds

For questions about this website, please contact Alexa Ross at UW-Madison SSEC.

Summary

- NOAA/NESDIS/OSPO 'manati' website is chock full of useful information
- It's easy to reformat the information at that website to create larger domains, and long(ish) animations
- This allows a user to view how things like winds and waves are evolving with time in a more simple format
- Questions?
 - scott.lindstrom@noaa.gov (I can share the shell script that does all the work if you want – it does use ImageMagick to manipulate the imagery)