

## ESA–MOST China Dragon 4 Cooperation

# → ADVANCED TRAINING COURSE IN OCEAN AND COASTAL REMOTE SENSING

12 to 17 November 2018 | Shenzhen University | P.R. China

# Sea Surface Salinity using SNAP & SMOS data

Hosted by



# Header inspection (i)



- File -> Open product
- Load  
SM\_OPER\_MIR\_OSUDP  
2\_20180607T075716\_2  
0180607T085033\_662\_  
001\_1.DBL
- Metadata -> variable  
header -> specific  
product header -> main  
info -> time info
- Inspect validity time  
and ascending flag

The screenshot shows a software interface with a metadata tree on the left and a table of metadata values on the right. The tree structure is as follows:

- Product Explorer
  - [1] SM\_OPER\_MIR\_OSUDP2\_20180607T075716\_20180607T085033\_662\_001\_1
  - Metadata
    - Fixed\_Header
    - Variable\_Header
      - Main\_Product\_Header
      - Specific\_Product\_Header
        - Main\_Info
          - Time\_Info (highlighted)
          - Quality\_Information
          - L2\_Product\_Description
          - L2\_Product\_Location
          - List\_of\_Data\_Sets
    - Flag Codings
    - Vector Data
    - Bands
    - Masks

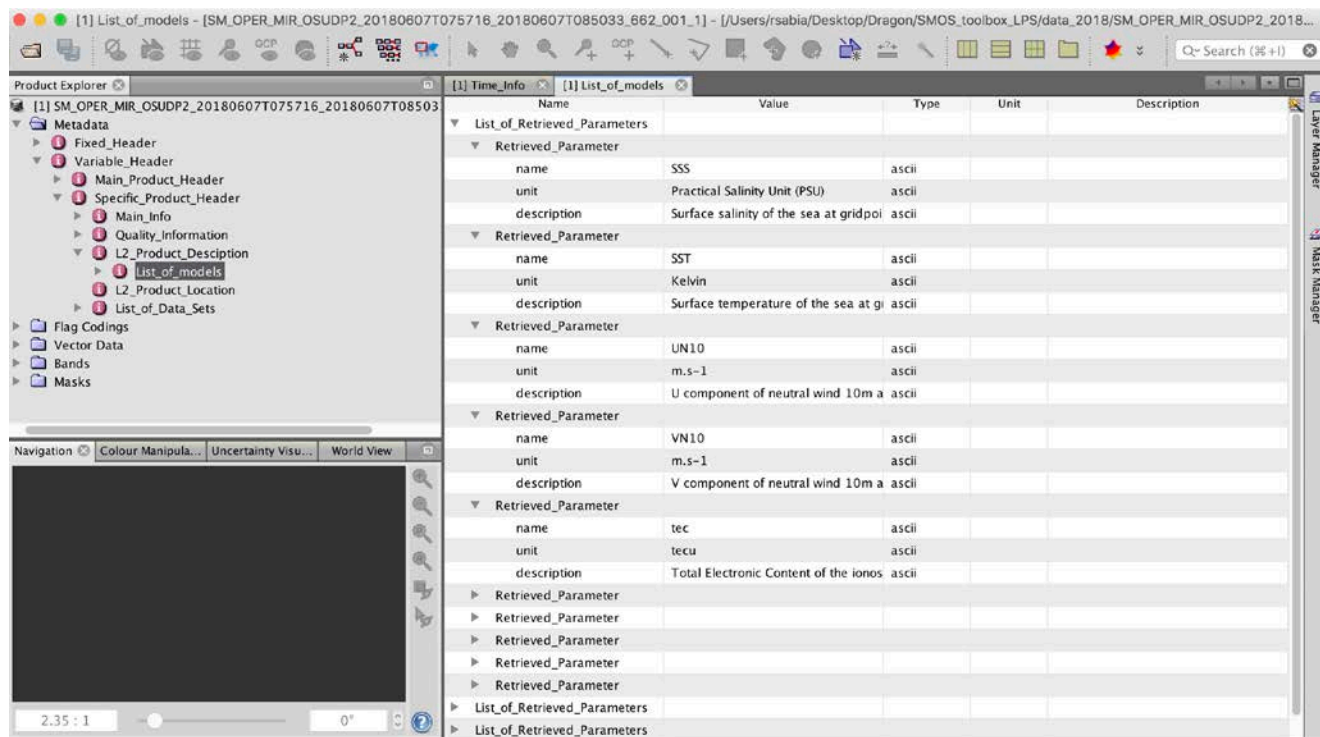
The table of metadata values is as follows:

Name	Value	Type	Unit	Description
Precise_Validity_Start	UTC=2018-06-07T07:57:15.360101	ascii		
Precise_Validity_Stop	UTC=2018-06-07T08:50:33.392908	ascii		
Abs_Orbit_Start	+45171	ascii		
Start_Time_ANX_T	4309.187103	ascii		
Abs_Orbit_Stop	+45172	ascii		
Stop_Time_ANX_T	1502.740238	ascii		
UTC_at_ANX	UTC=2018-06-07T06:45:26.098648	ascii		
Long_at_ANX	-011.058802	ascii		
Ascending_Flag	A	ascii		
Polarisation_Flag	F	ascii		



# Header inspection (ii)

- Metadata -> variable header -> specific product header -> L2 product description -> list of models
- Inspect list of retrieved parameters



The screenshot shows a software interface with a tree view on the left and a table on the right. The tree view shows a hierarchy of metadata, including 'List\_of\_models' which is expanded to show 'List\_of\_Retrieved\_Parameters'. The table on the right displays the details of these parameters.

Name	Value	Type	Unit	Description
List_of_Retrieved_Parameters				
Retrieved_Parameter				
name	SSS	ascii		
unit	Practical Salinity Unit (PSU)	ascii		
description	Surface salinity of the sea at gridpoi	ascii		
Retrieved_Parameter				
name	SST	ascii		
unit	Kelvin	ascii		
description	Surface temperature of the sea at gi	ascii		
Retrieved_Parameter				
name	UN10	ascii		
unit	m.s-1	ascii		
description	U component of neutral wind 10m a	ascii		
Retrieved_Parameter				
name	VN10	ascii		
unit	m.s-1	ascii		
description	V component of neutral wind 10m a	ascii		
Retrieved_Parameter				
name	tec	ascii		
unit	tecu	ascii		
description	Total Electronic Content of the ionos	ascii		
Retrieved_Parameter				
Retrieved_Parameter				
Retrieved_Parameter				
Retrieved_Parameter				
Retrieved_Parameter				
Retrieved_Parameter				
List_of_Retrieved_Parameters				
List_of_Retrieved_Parameters				

# Flags inspection



- Flag coding -> science flags
- Inspect the variety of science flags

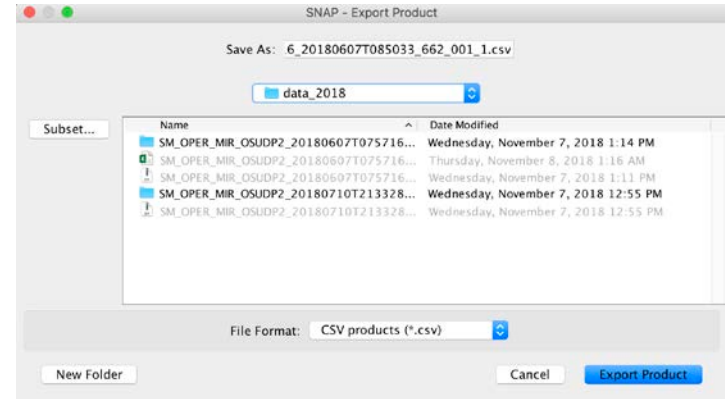
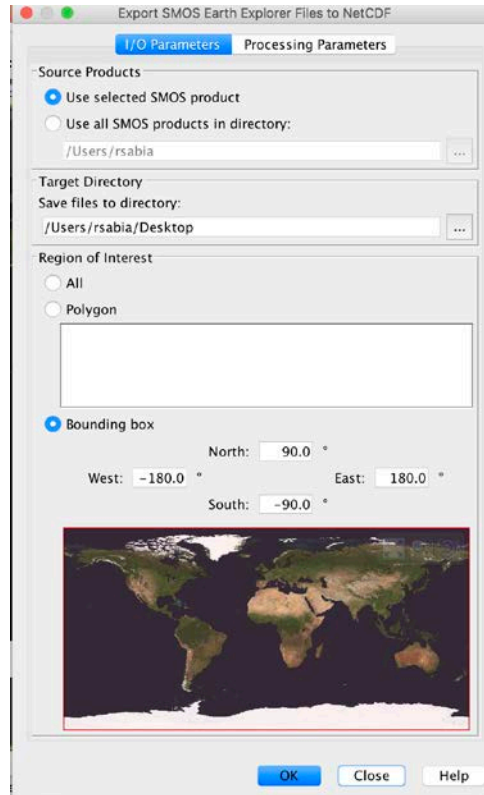
Name	Value	Type	Unit	Description
FG_SC_LAND_SEA_COAST1	1	uint32		Distance from coast to gridpoint is less than
FG_SC_LAND_SEA_COAST2	2	uint32		Distance from coast to gridpoint is less than
FG_SC_TEC_GRADIENT	4	uint32		High TEC gradient along dwell for a grid point
FG_SC_IN_CLIM_ICE	8	uint32		Gridpoint with maximum extend of sea ice at
FG_SC_ICE	16	uint32		Ice concentration at gridpoint is above thresh
FG_SC_SUSPECT_ICE	32	uint32		Suspect ice on gridpoint
FG_SC_RAIN	64	uint32		Heavy rain suspected on gridpoint. Rain rate
FG_SC_HIGH_WIND	128	uint32		High wind
FG_SC_LOW_WIND	256	uint32		Low wind
FG_SC_HIGHT_SST	512	uint32		High SST
FG_SC_LOW_SST	1024	uint32		Low SST
FG_SC_HIGH_SSS	2048	uint32		High SSS
FG_SC_LOW_SSS	4096	uint32		Low SSS
FG_SC_SEA_STATE_1	8192	uint32		Sea state class 1
FG_SC_SEA_STATE_2	16384	uint32		Sea state class 2
FG_SC_SEA_STATE_3	32768	uint32		Sea state class 3
FG_SC_SEA_STATE_4	65536	uint32		Sea state class 4
FG_SC_SEA_STATE_5	131072	uint32		Sea state class 5
FG_SC_SEA_STATE_6	262144	uint32		Sea state class 6
FG_SC_SST_FRONT	524288	uint32		
FG_SC_SSS_FRONT	1048576	uint32		
FG_SC_ICE_ACARD	2097152	uint32		Ice flag from cardioid
FG_SC_ECMWF_LAND	4194304	uint32		Grid point contains some land. Flag set if EC



# Data export

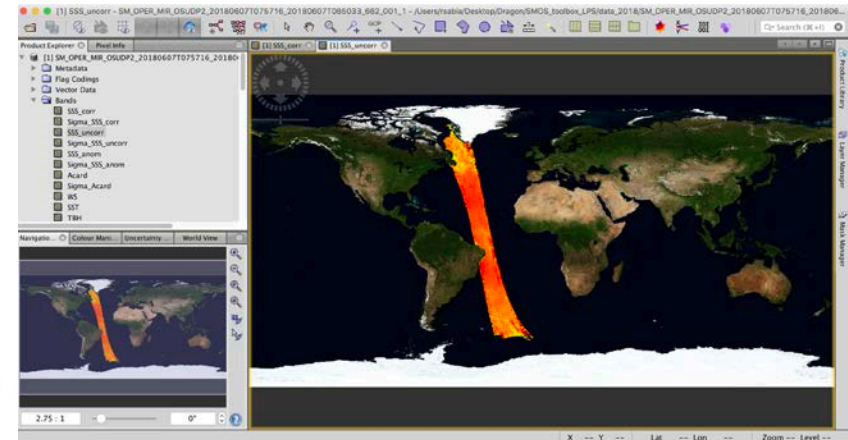
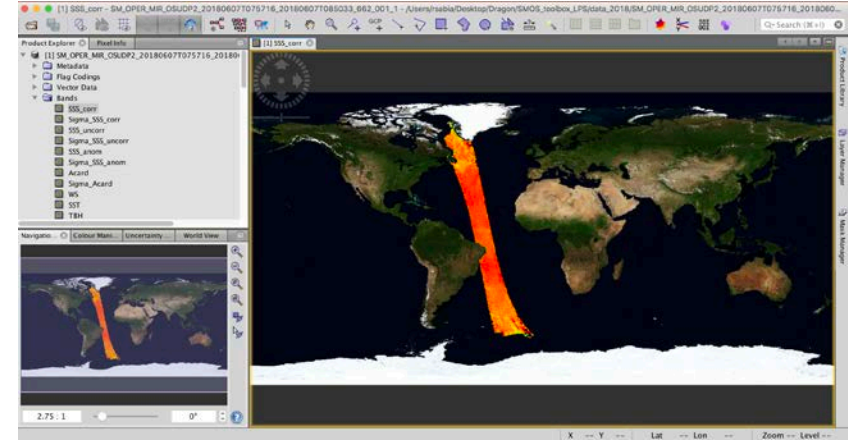


- File -> export -> SMOS EE file to netCDF
- Export product as .nc
- File -> export -> CSV
- View capability of exporting product as .csv [it takes too long]

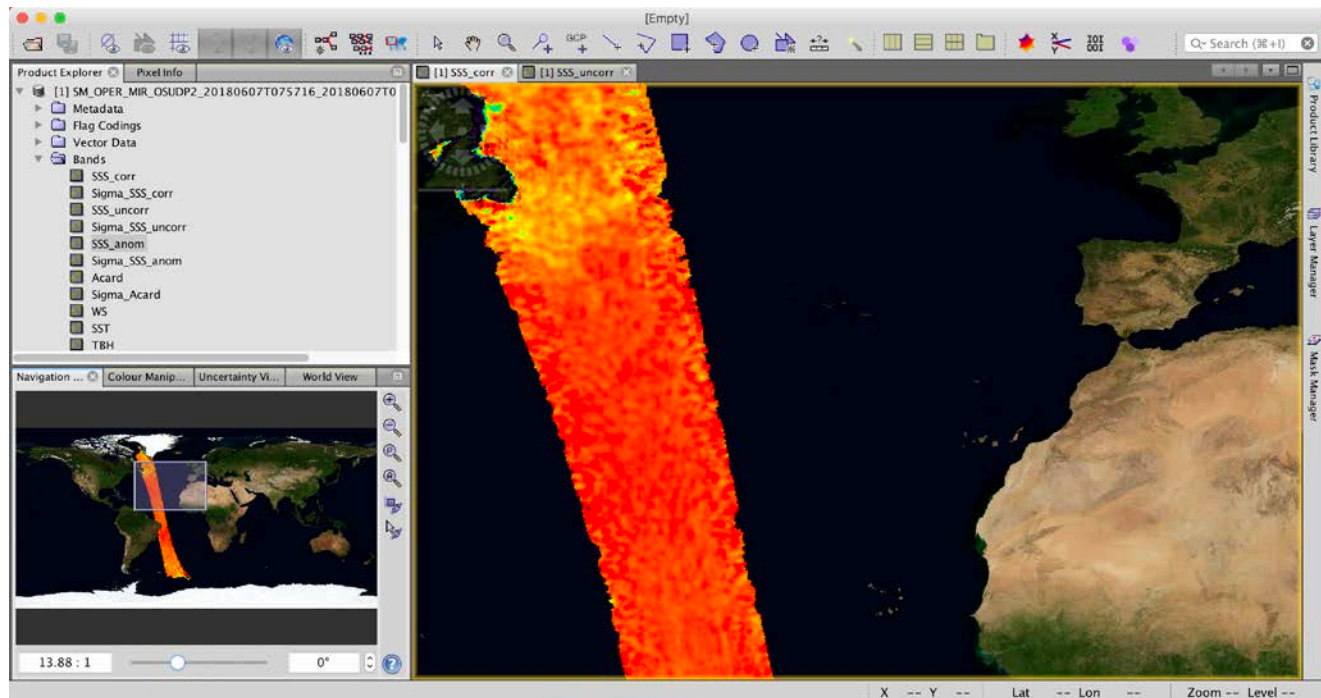


# Products visualization (i)

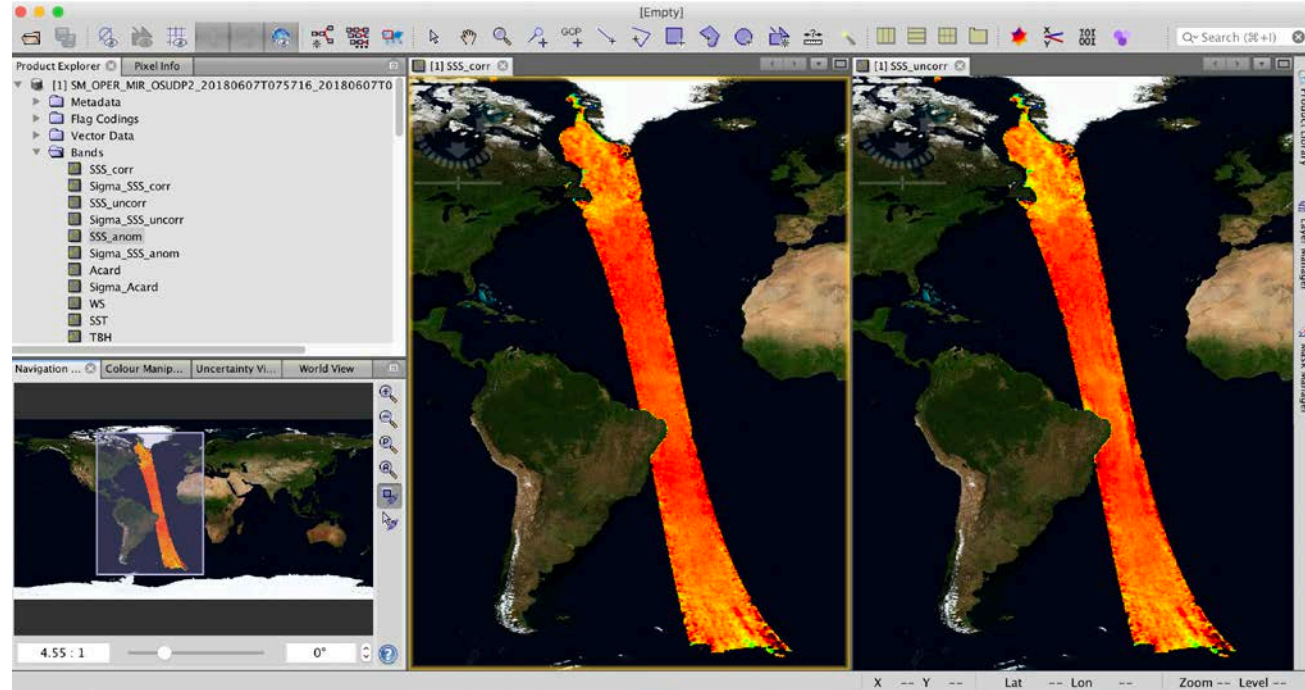
- Bands -> SSS\_corr
- Visualize SSS overpass (corrected product)
- Bands -> SSS\_uncorr
- Visualize SSS overpass (uncorrected product)



- Navigation window
- Experiences functionalities: zoom, pan, rotate etc.

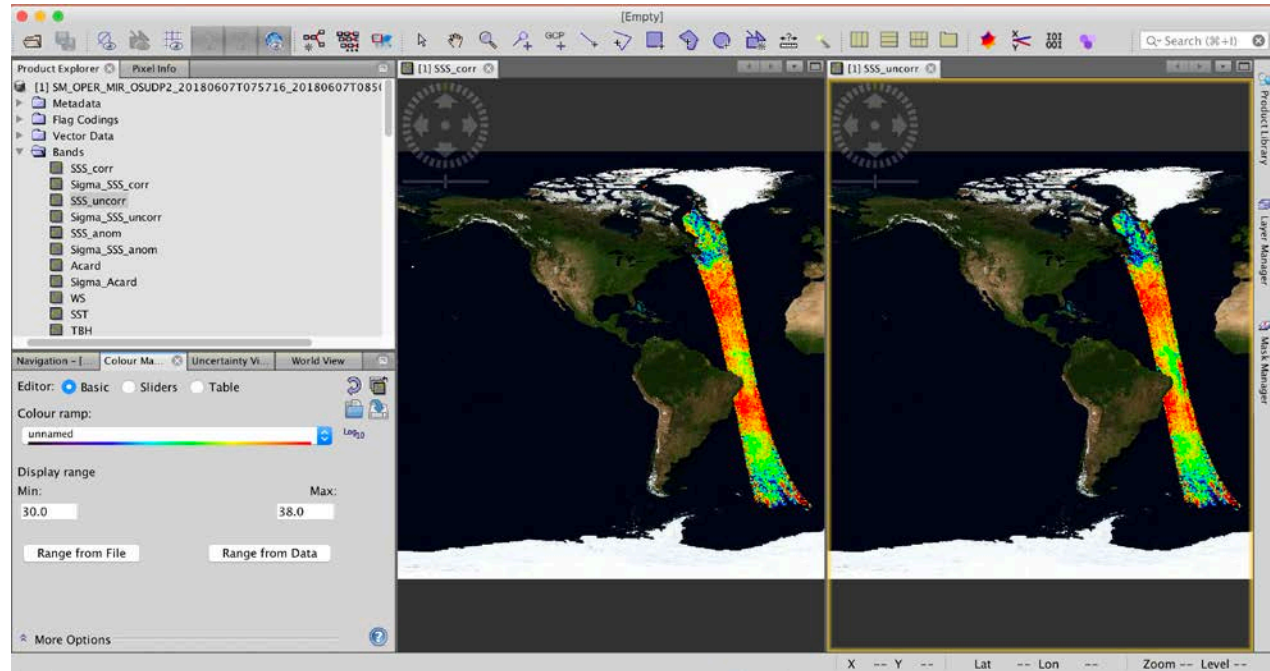


- Window -> Tile horizontally
- “Synchronize views across multiple image windows” button
- Visualize two images adjacently and synced

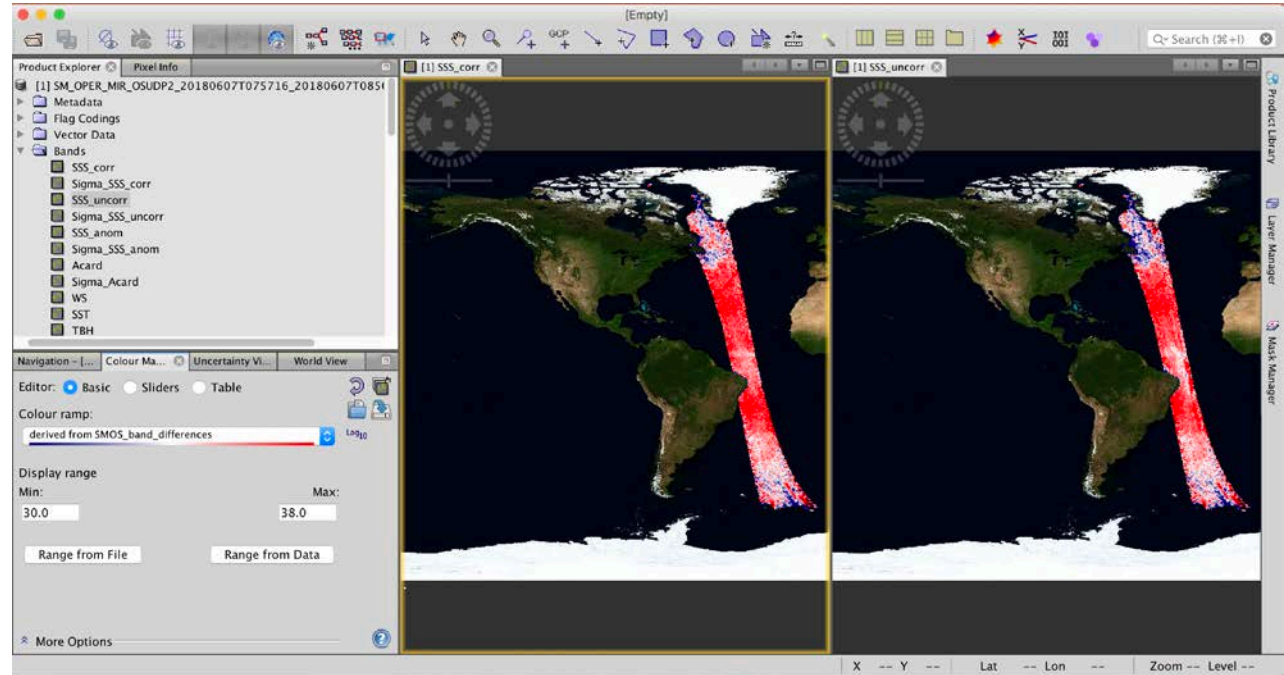




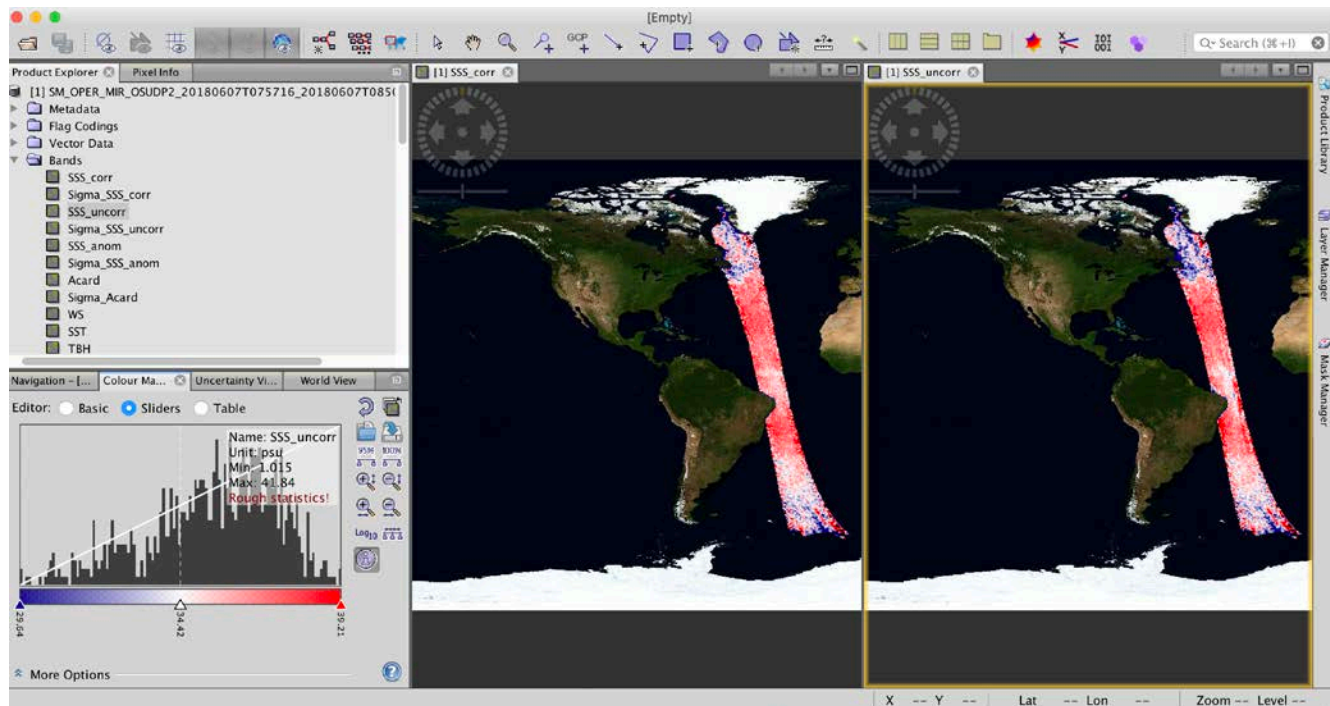
- Colour manipulation -> basic
- Choose a min/max value [eg. 30 38]
- Play with colour palette selecting different min/max values



- Colour manipulation -> basic
- Colour ramp -> pick "derived from SMOS band differences"
- Visualize colour palette designed for SMOS

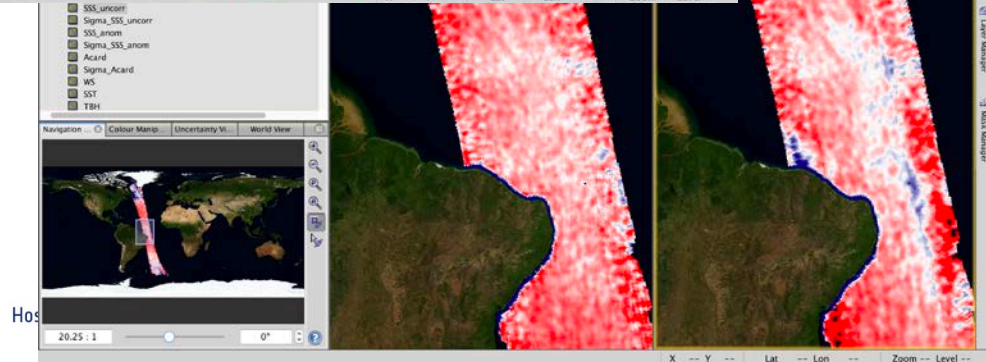
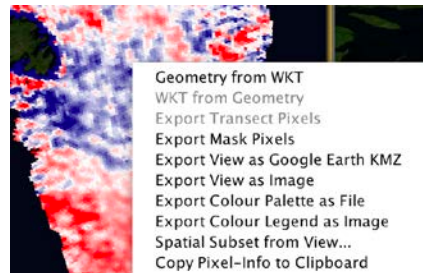
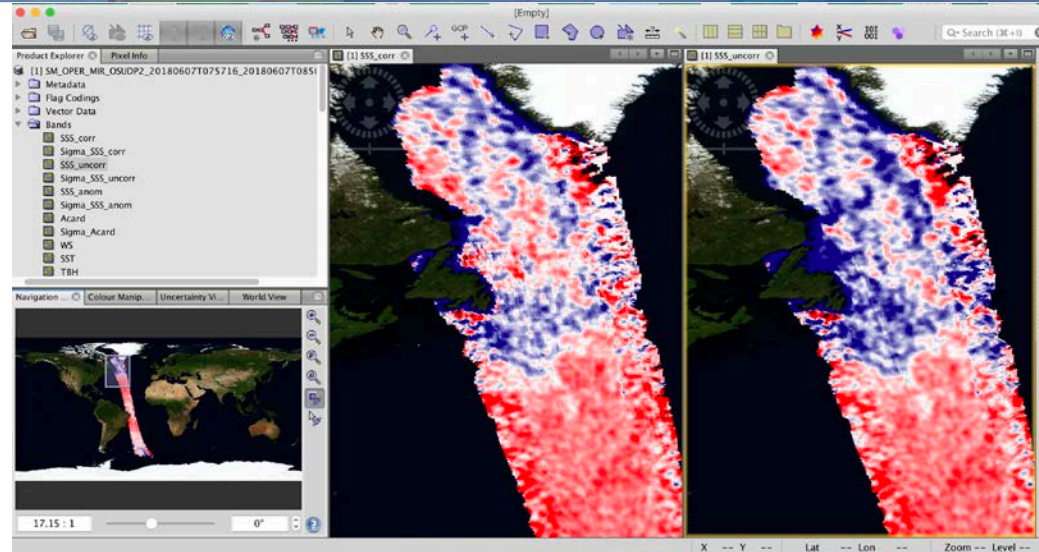


- Colour manipulation -> sliders
- Play with stretch/shrink histograms H/V
- Visualize effect sliding manually along the histogram
- Distribute slides evenly
- Apply "auto-adjust to 95% pixels"



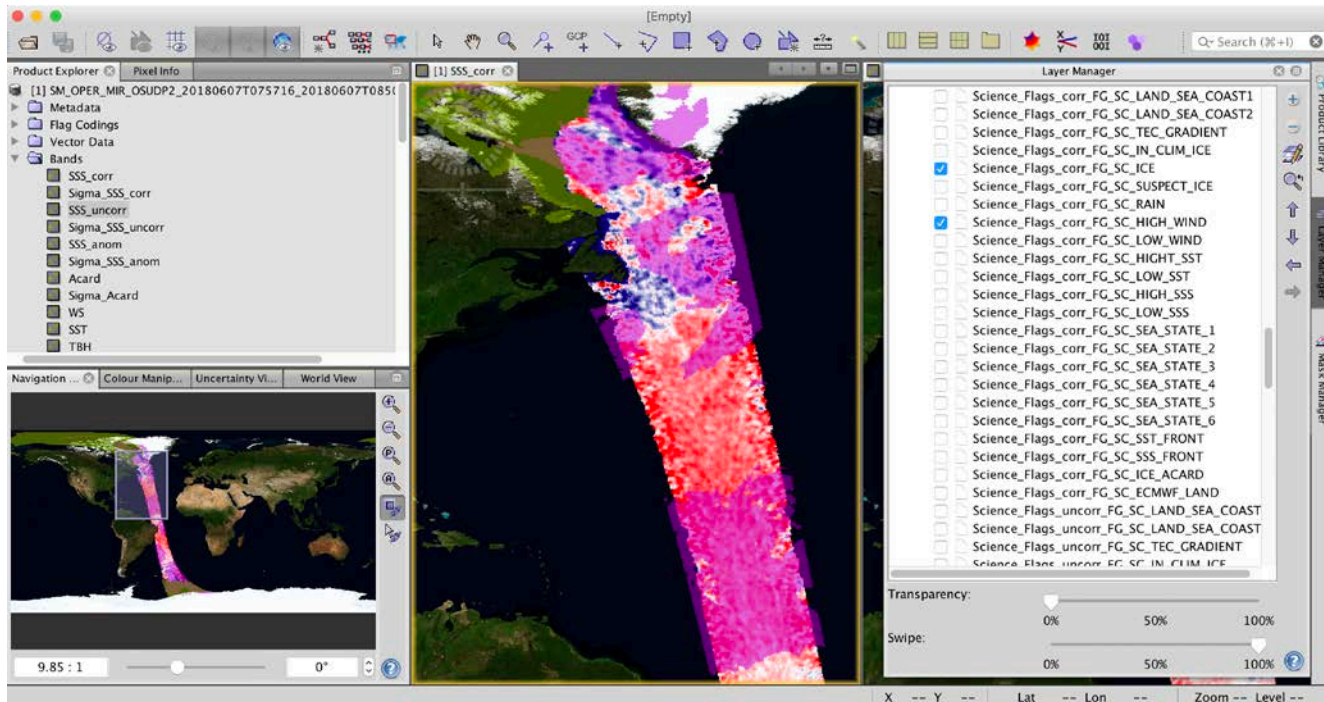
# LSC correction

- Zoom to see effect of Land-Sea Contamination correction by comparing the two products (SSS\_corr and SSS\_uncorr)
- Right-click on image and explore options



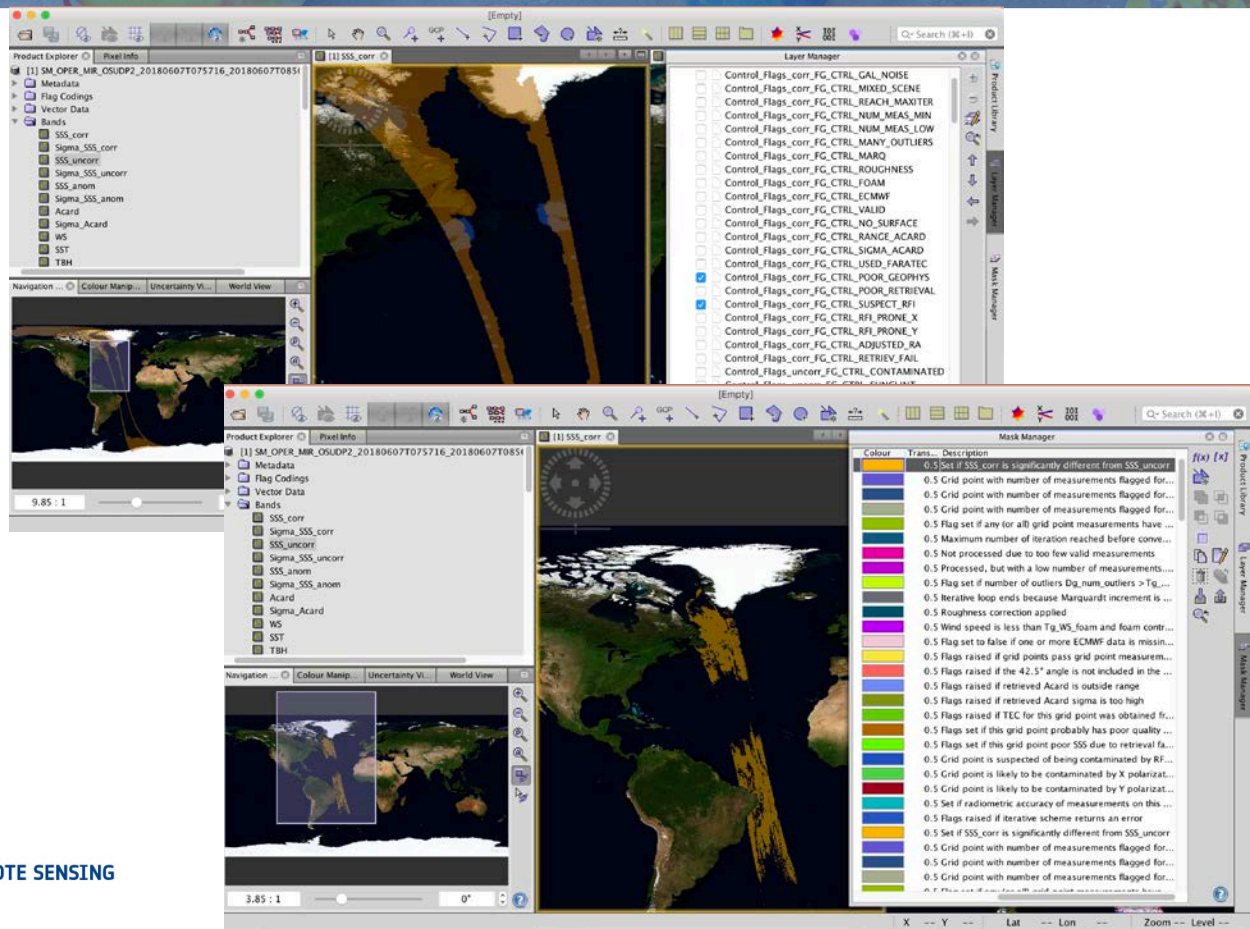
# Flags analysis (i)

- Layer -> Layer manager  
-> masks
- Play activating and deactivating various ctrl and science flags to assess their relevance (e.g, ice, high wind etc.)

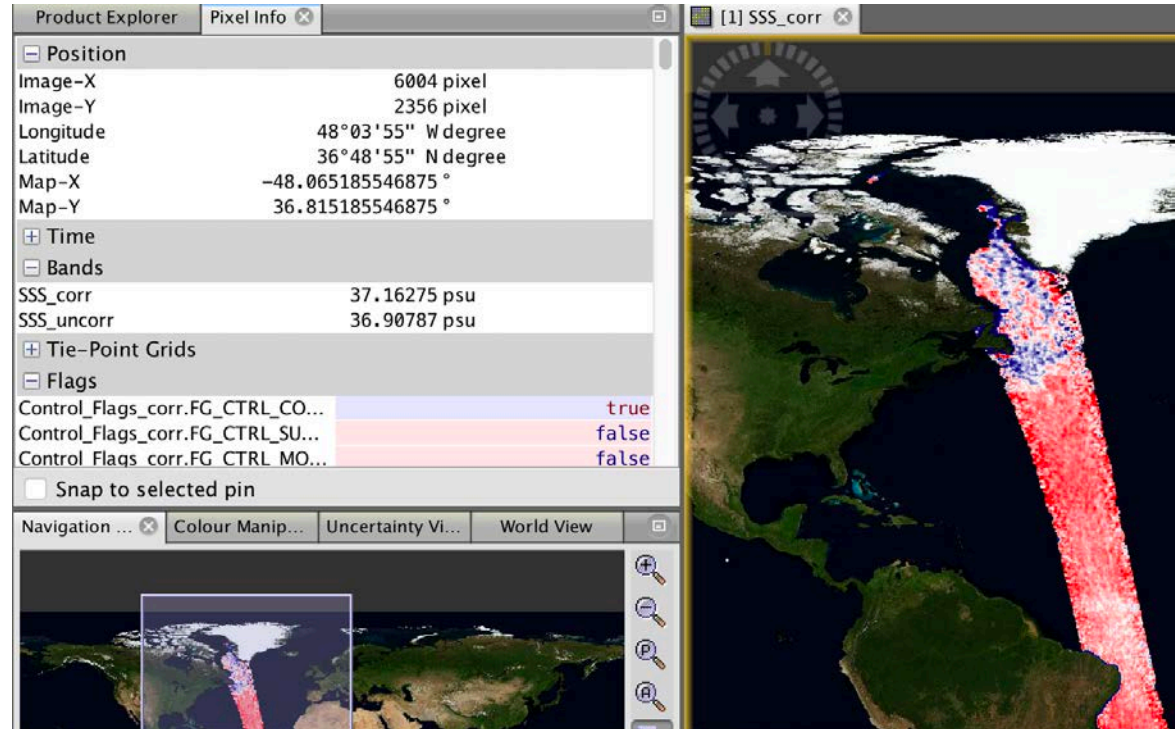


# Flags analysis (ii)

- Layer -> Layer manager -> masks
- Play activating and deactivating various ctrl and science flags to assess their relevance
- Select/Deselect the underlying SSS\_corr field to better visualize the flags
- Mask manager [right vertical; bar]
- Inspect masks colour and description (e.g, significant difference btw SSS corr and uncorr )



- Pixel info box [top left]
- Pan over the semi-orbit and see live information on values, coordinates and flags



The screenshot shows the 'Pixel Info' window in the Product Explorer software. The window displays the following information:

Position	
Image-X	6004 pixel
Image-Y	2356 pixel
Longitude	48°03'55" W degree
Latitude	36°48'55" N degree
Map-X	-48.065185546875 °
Map-Y	36.815185546875 °

Time	
[Time information is present but not fully legible]	

Bands	
SSS_corr	37.16275 psu
SSS_uncorr	36.90787 psu

Tie-Point Grids	
[Tie-Point Grids information is present but not fully legible]	

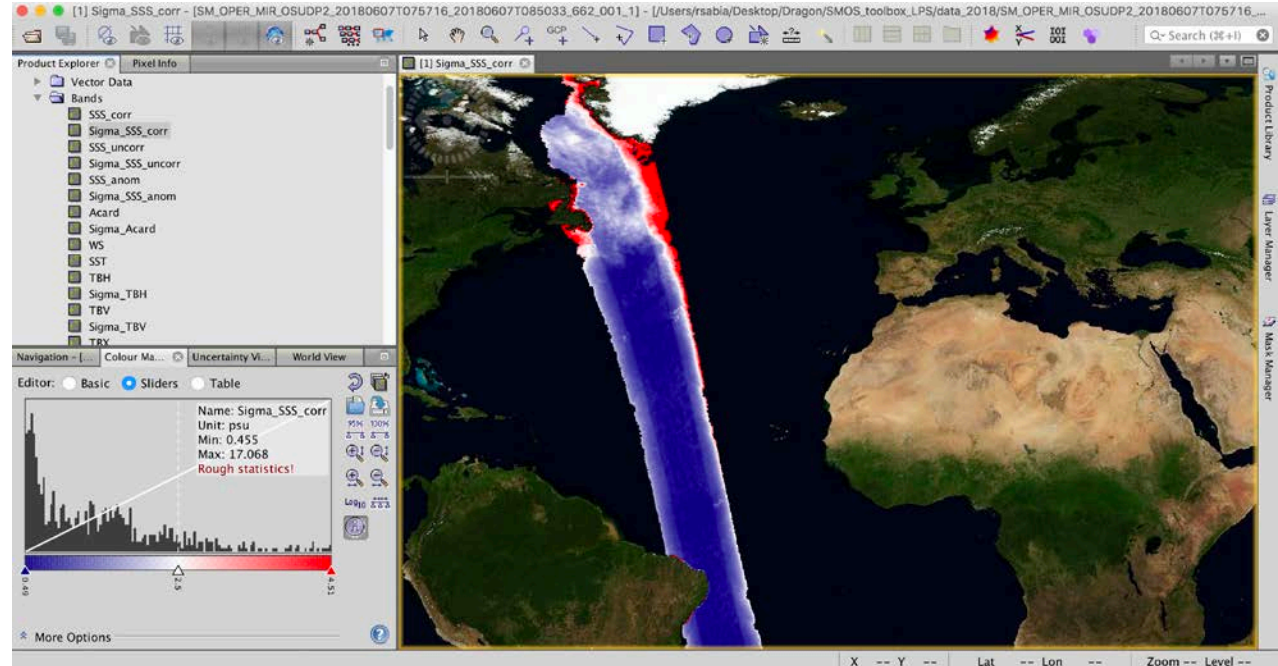
  

Flags	
Control_Flags_corr.FG_CTRL_CO...	true
Control_Flags_corr.FG_CTRL_SU...	false
Control_Flags_corr.FG_CTRL_MO...	false

There is also a checkbox for 'Snap to selected pin' which is currently unchecked.

The main window shows a satellite image of the North Atlantic Ocean with a red and blue pixel trail. The interface includes navigation and zoom controls on the right side of the image.

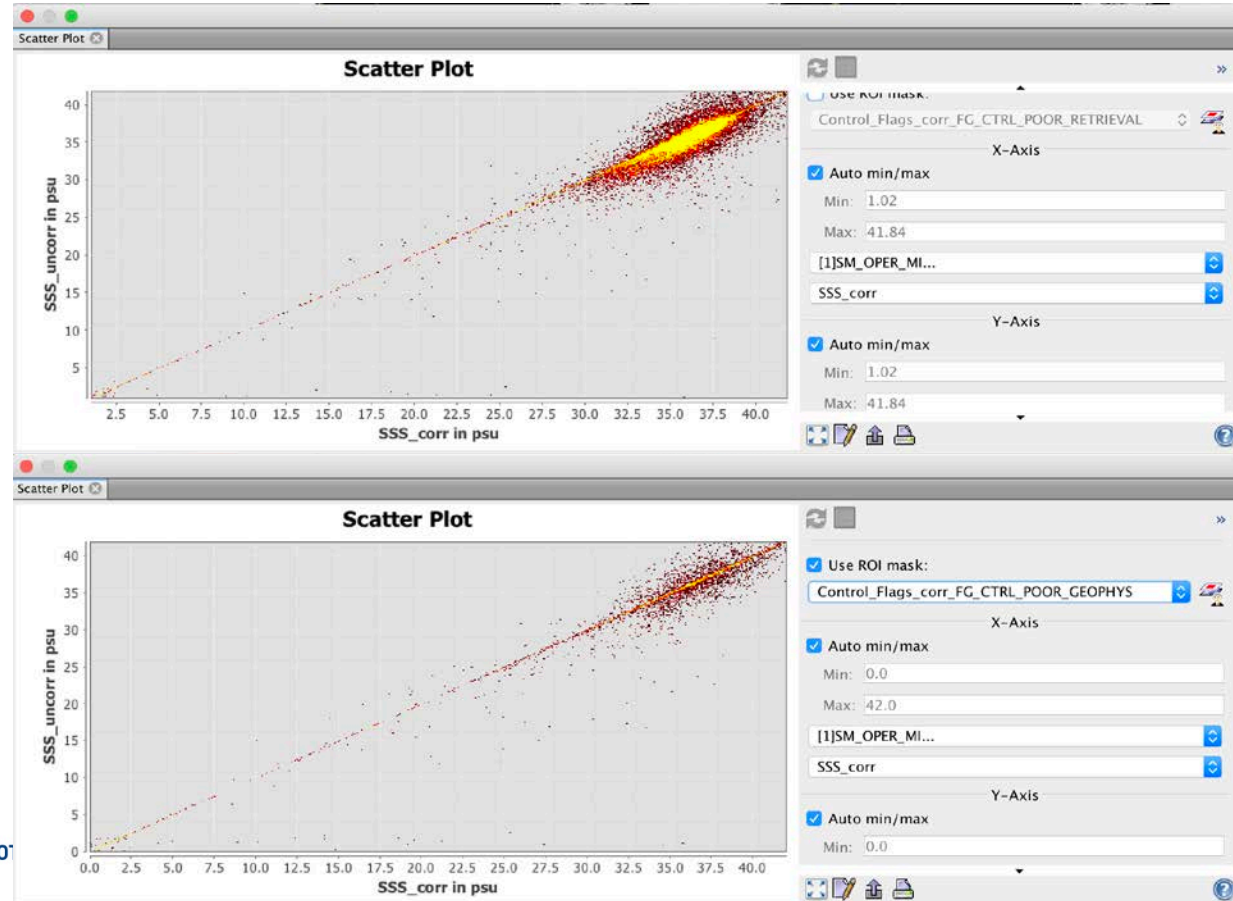
- Bands -> Sigma\_SSS\_corr
- Colour manipulation -> basic
- Colour ramp -> pick "derived from SMOS band differences"
- Apply "auto-adjust to 95% pixels"
- Visualize values of salinity uncertainty per pixel (corrected product)



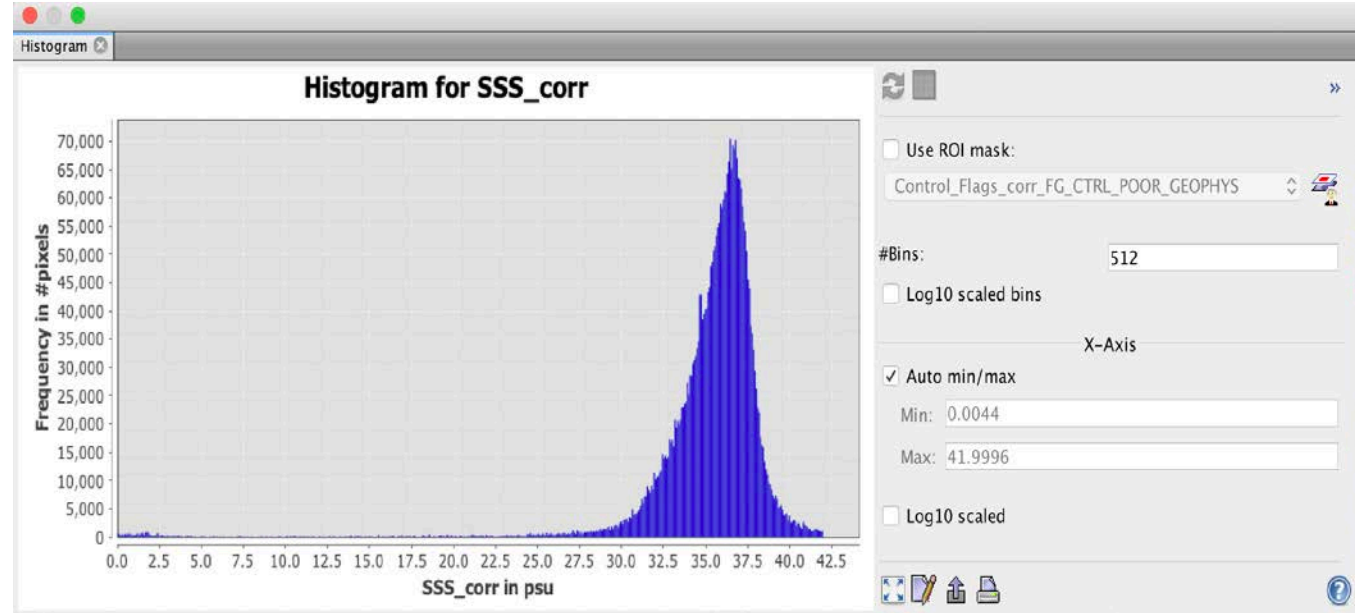


# Scatter plots

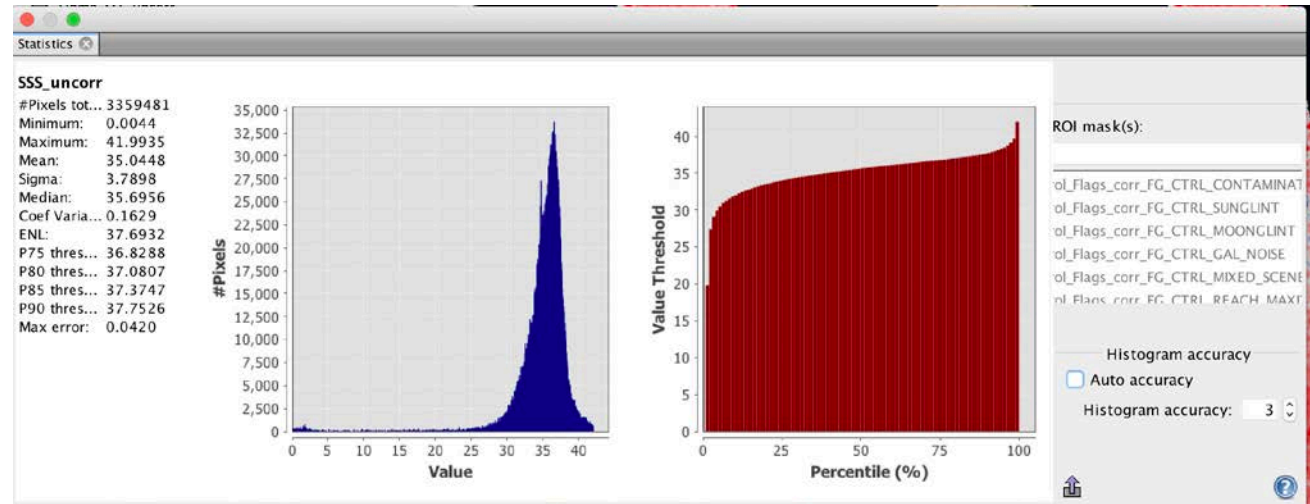
- Analysis -> scatter plot
- Select SSS\_corr and SSS\_uncorr in the two axes
- Deselect "Use ROI mask"
- Refresh view button
- Analyse scatter plot
- Select "Use ROI mask" -> select one flag eg. CTRL\_poor\_geophysical
- Refresh view button
- Analyse variation of scatter plot



- Analysis -> histograms
- Select SSS\_corr
- Refresh view button
- **Analyse histogram plot**



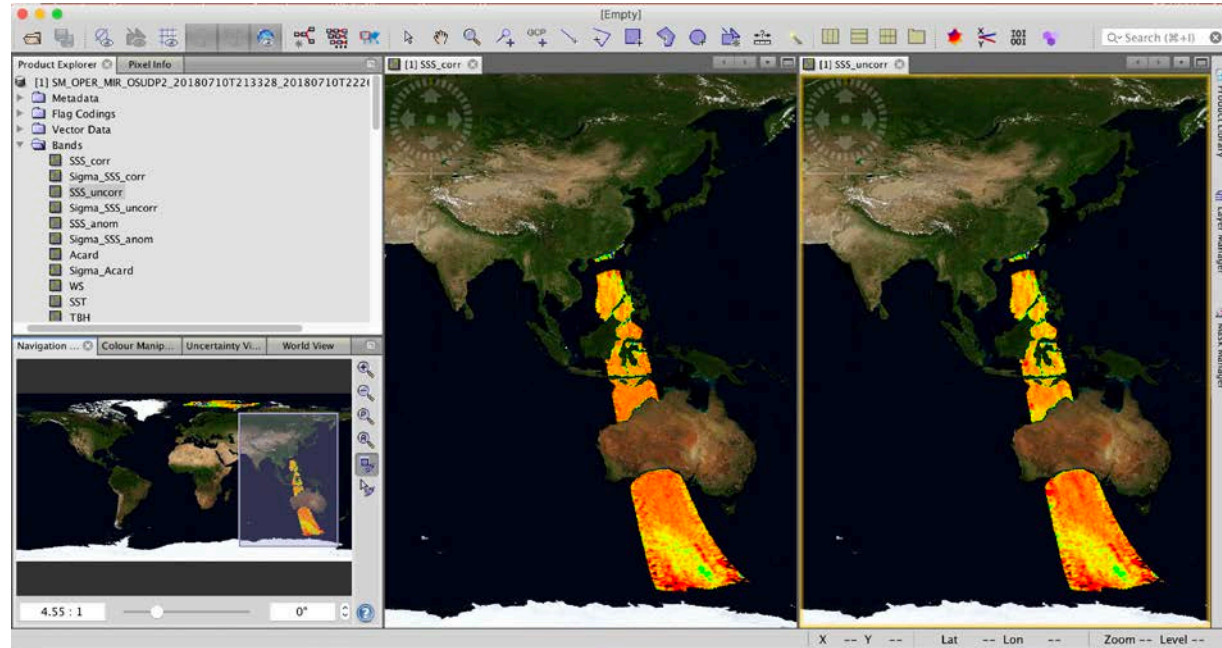
- Analysis -> statistics
- Select SSS\_uncorr
- Refresh view button
- Analyse numerical statistics and cdf plot



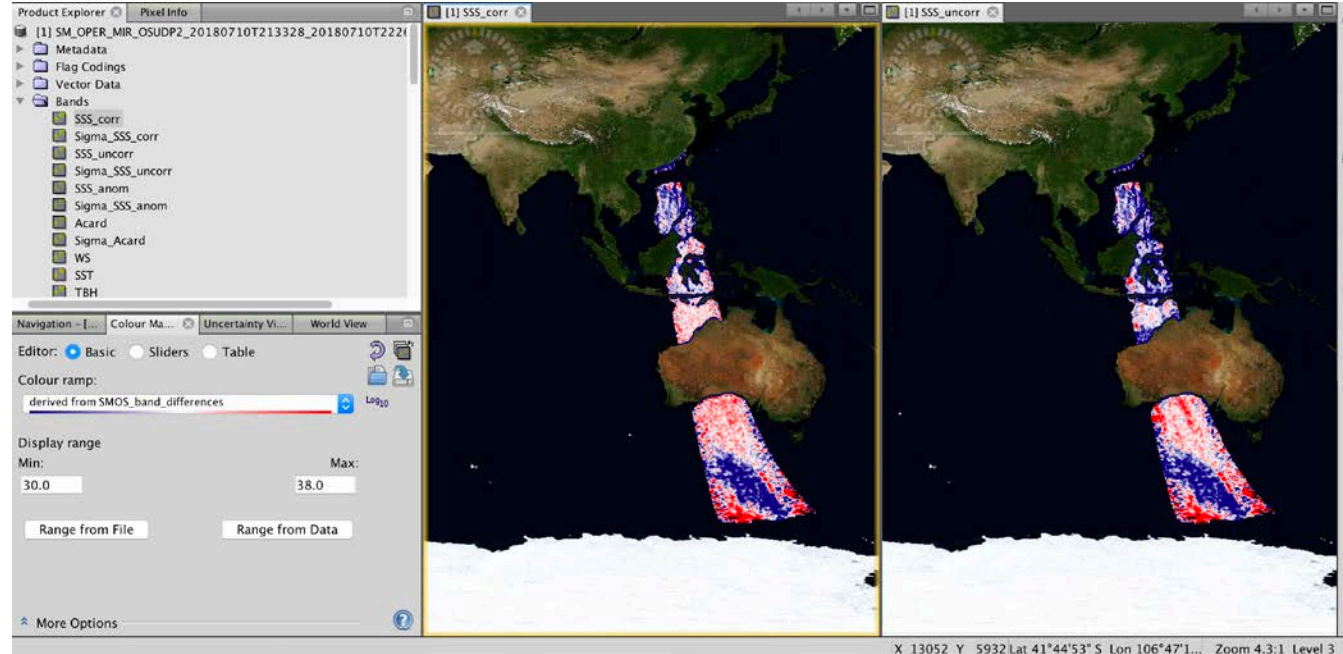
# Products visualization (i)



- File -> Open product
- Load  
SM\_OPER\_MIR\_OSUDP2\_20180710T213328\_20180710T222648\_662\_001\_1.DBL
- Bands -> SSS\_corr
- Bands -> SSS\_uncorr
- Window -> Tile horizontally
- “Synchronize views across multiple image windows” button
- Inspect new overpasses

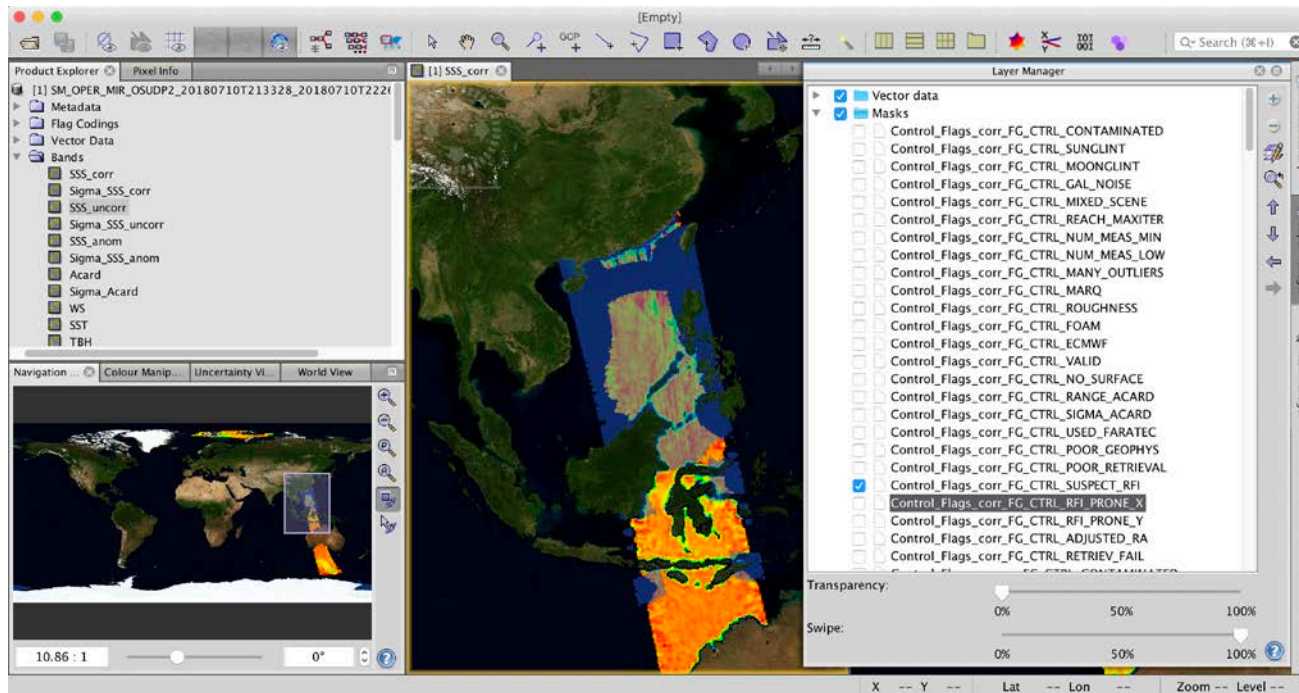


- Colour manipulation -> basic
- Choose a min/max value [eg. 30 38]
- Colour ramp -> pick "derived from SMOS band differences"
- Visualize two synced images adjacently

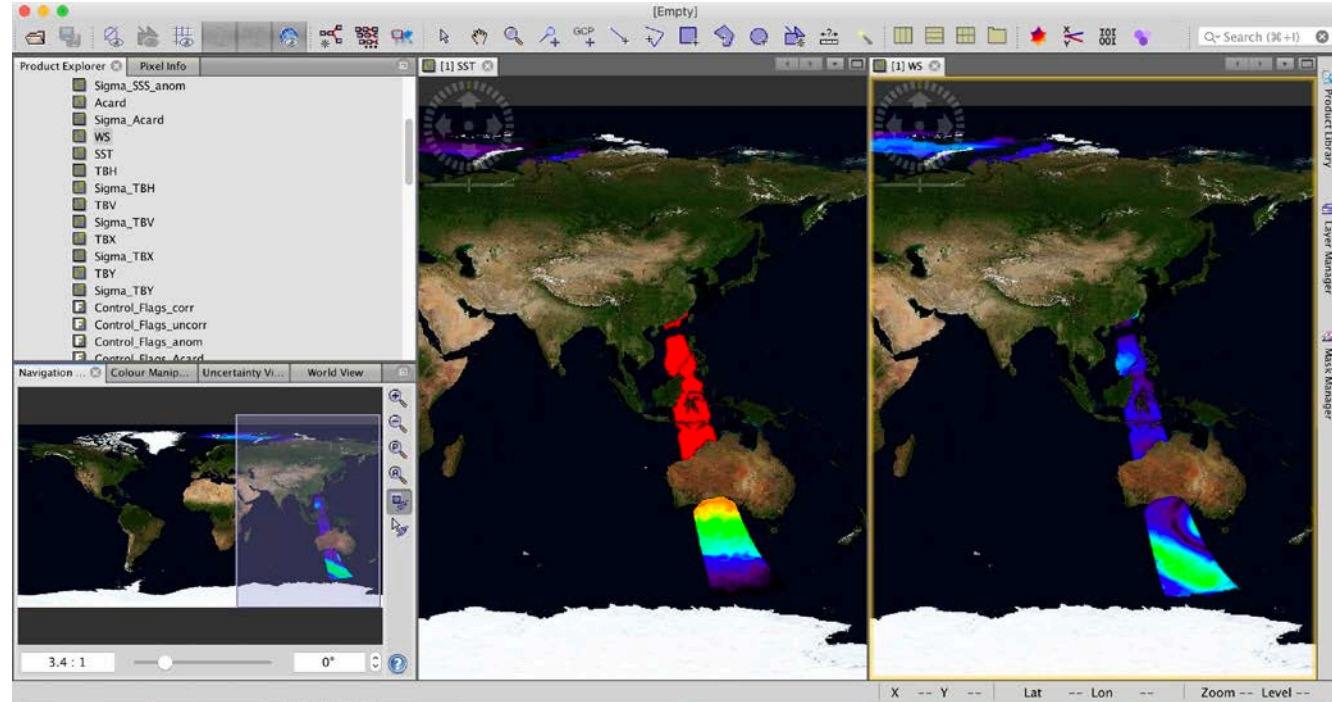


# Products visualization (iii)

- Pan to go to coastal region
- Layer -> Layer manager  
-> masks
- Play activating and deactivating various ctrl and science flags to assess their relevance (especially RFI)



- Close SSS\_corr and SSS\_uncorr
- Bands -> SST
- Bands -> WS
- Visualize additional retrieved parameters of sea surface temperature and wind speed



# SNAP forum



- Visit SNAP blog and forum

The screenshot shows the SNAP forum interface. At the top, there is a navigation bar with the 'step forum' logo, 'Sign Up', and 'Log In' buttons. Below this, there are filters for 'all categories', 'Categories', 'Latest', and 'Top'. The main content area is divided into two columns: 'Category' and 'Latest'.

**Category listings:**

- s1tbx** (2566 topics): The S1 Toolbox category regroups all threads about the Sentinel-1 Toolbox, as SAR readers or processors. Sub-categories: Problem Reports, Interferometry, Polarimetry, STaMPS.
- s2tbx** (1392 topics): The S2 Toolbox category regroups all threads about the Sentinel-2 Toolbox as Sentinel-2 product readers and product manipulation, Sentinel-2 processors as L2A processor for atmospheric correction, L3 processor for temporal synthesis, etc. Sub-categories: sen2cor, sen2three, Problem Reports.
- s3tbx** (240 topics): The S3 Toolbox category regroups all threads about the Sentinel-3 Toolbox as readers and processors for Sentinel-3 OLCI & SLSTR L1 & L2. Sub-categories: Problem Reports.
- snap** (945 topics): This category contains all topic about the Sentinel Toolbox Application (SNAP) not related to a specific Sentinel Toolbox.

**Latest topics:**

- Welcome to the Sentinel Toolbox Exploitation Platform Forum (10 replies, Jul '17) by snap
- Making interferogram for TANDEM-X bistatic mode (4 replies, 1m) by interferometry
- Radiometric & Geometric Correction Workflow (114 replies, 2h) by s1tbx
- Area de interes descomposicion polarimetrica (0 replies, 2h) by s1tbx
- Exporting sentinel 1 band to Geotiff (31 replies, 4h) by snap
- Sea Surface Current (0 replies, 4h) by s3tbx
- SNAP - Problem with Windows 7 (4 replies, 9h) by snap

