


# The CoastWatch Utilities

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# Talk Outline

-  About the Software
-  Current Functionality
-  Development



# Users



About the  
Software

Current  
Functionality

Development

- Government
- Academic
- Private / commercial



# Functions



About the Software

Current Functionality

Development

Graphical interface

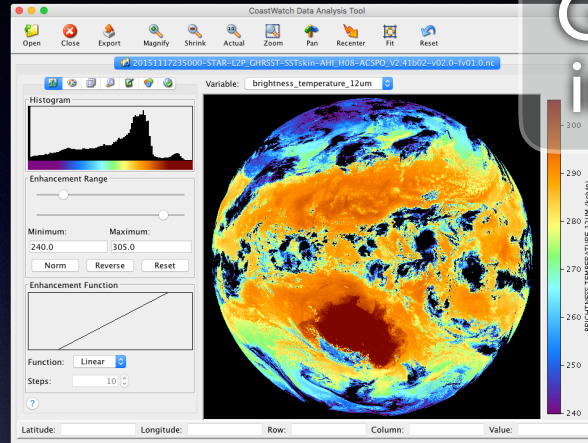
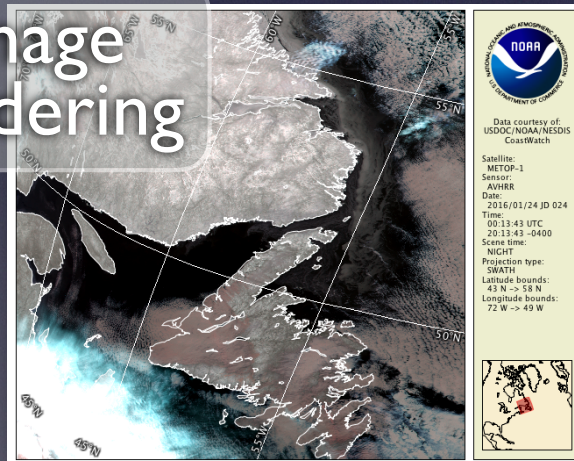


Image rendering



```
phollema ~ -bash -- 110x34
Contents of file /Users/phollema/Documents/Work/NOAA/FY16/Work/2015.11.18_john_sapper_hinawari_projection_issue/20151117235000-STAR-L2P_GHRST-SSTskin-AHI_H8B-ACSPQ_V2_41b02-v02-0-Fv91_0.nc

Global information:
Satellite: H8B
Sensor: AHI
Date: 2015/11/17 JD 521
Time: 23:59:00 UTC
Scene time: day
Projection type: data
Origin: NOAA/NESDIS/STAR
Format: Java-NetCDF-Interface (netCDF-4 ucar.nc2_dataset.conv.CF1Convention)
Reader Ident: noaa.coastwatch.io.CommonDataModelNCReader

Variable information:
Variable      Type      Dimensions      Units      Scale      Offset
sst_dttime   short    5500x5500        seconds    0.25       -0
dt_analysis  byte     5500x5500        kelvin     0.1        -0
satellite_zenith_angle byte     5500x5500        degrees    1          -0
sea_surface_temperature short    5500x5500        kelvin     0.01       -27315
ssea_bias    byte     5500x5500        kelvin     0.01       -0
ssea_standard_deviation byte     5500x5500        kelvin     0.01       -100.000002
sea_ice_fraction byte     5500x5500        1          0.01       -0
l2p_flags    short    5500x5500        -          -          -
quality_level byte     5500x5500        -          -          -
wind_speed   byte     5500x5500        m s-1      0.15       -0
brightness_temperature_11um short    5500x5500        kelvin     0.01       -27315
brightness_temperature_12um short    5500x5500        kelvin     0.01       -27315
brightness_temperature_dum short    5500x5500        kelvin     0.01       -27315
time         int      1                seconds since 1901-01-01 00:00:00 -
lat          float    5500x5500        degrees_north -
lon          float    5500x5500        degrees_east -

Exe:~ phollema
```

Command line processing



# Availability



About the  
Software

Current  
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Development

Mac



Windows



64-bit



Unix

Download from:  
[coastwatch.noaa.gov](http://coastwatch.noaa.gov)



# Documentation



About the  
Software

Current  
Functionality

Development



User's guide



CDAT help menu



Unix man pages



Javadoc API



YouTube videos



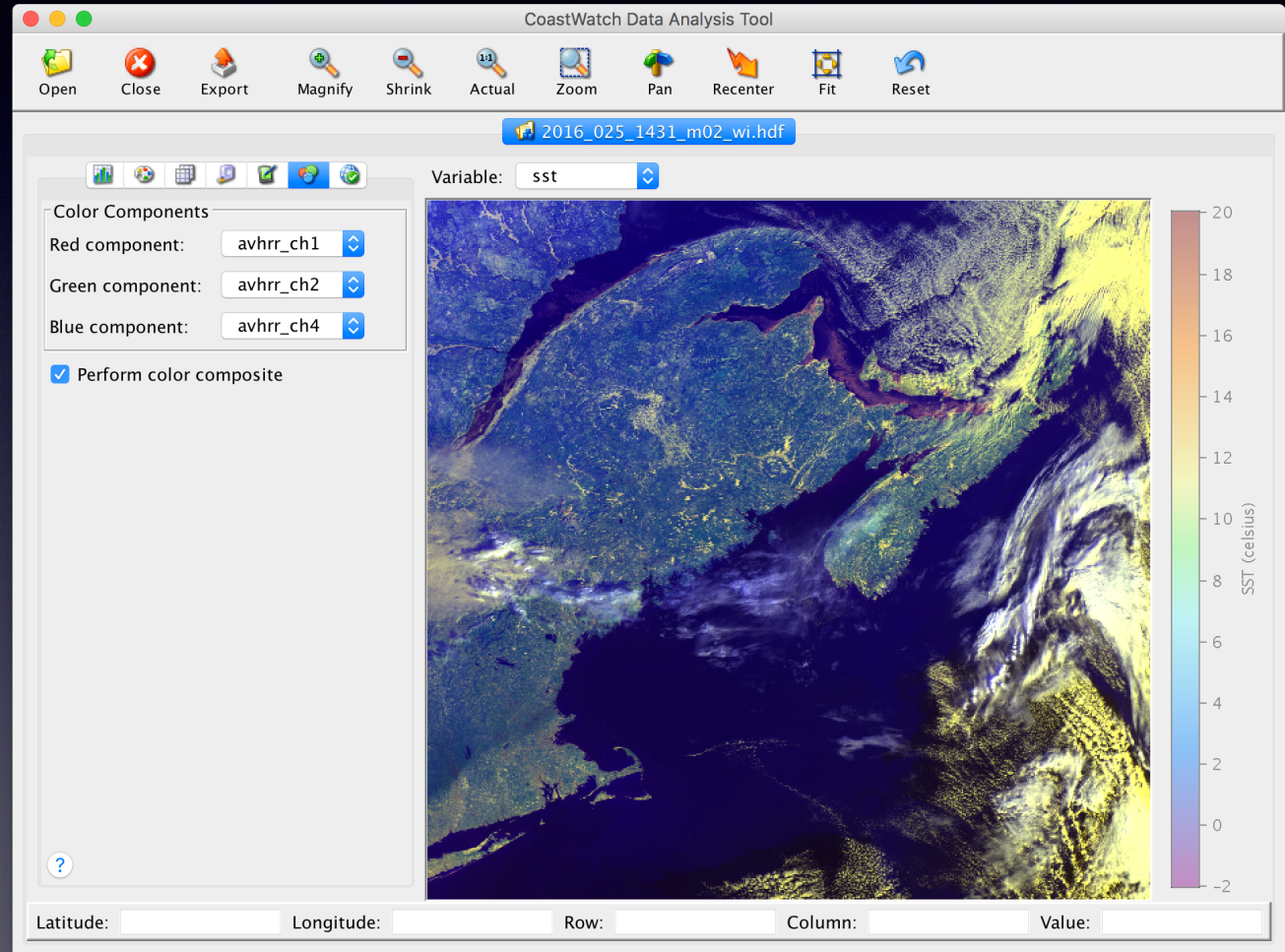
# Color Composite

About the  
Software



Current  
Functionality

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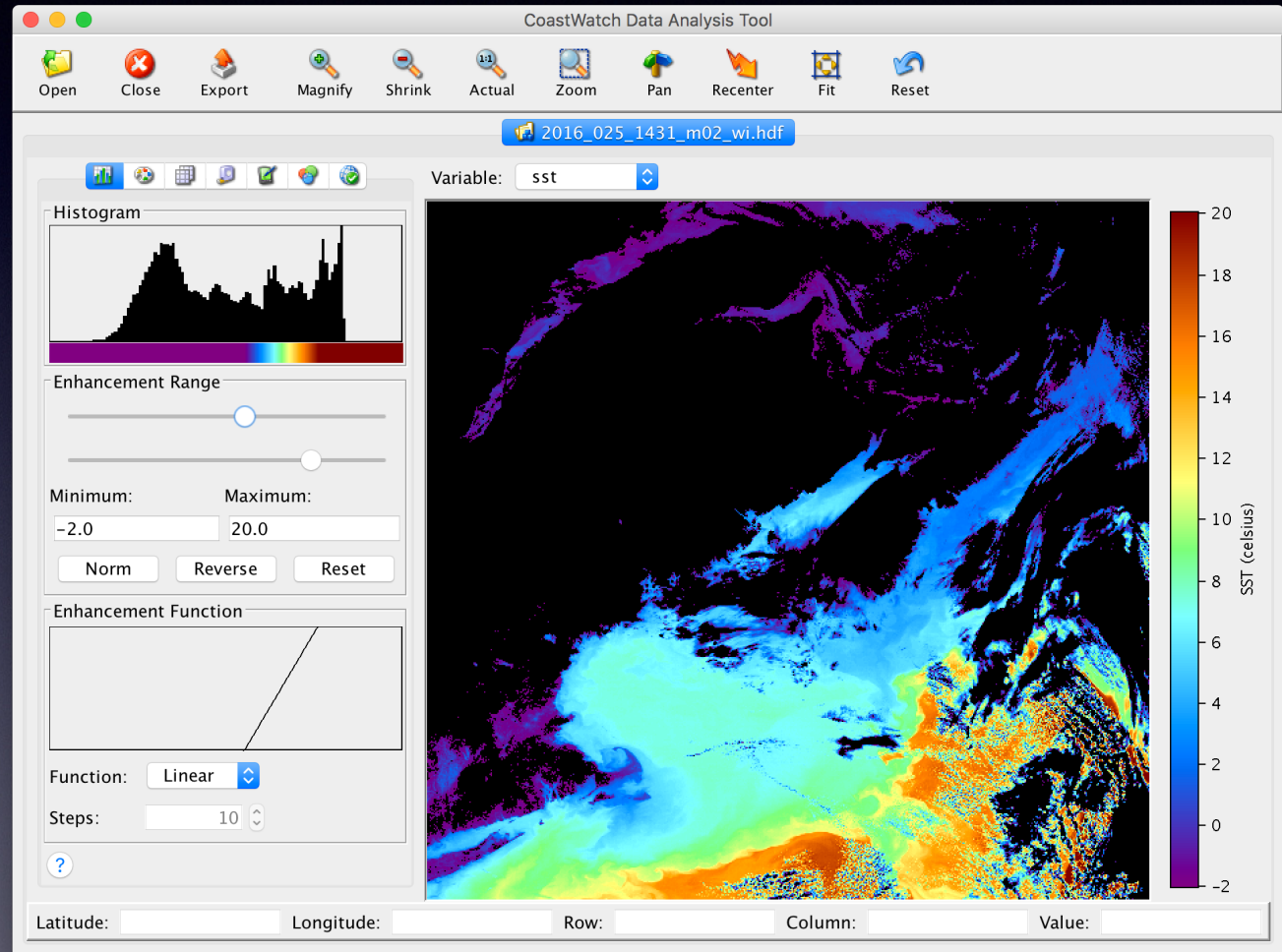
# Color Enhancement

About the Software



Current Functionality

Development





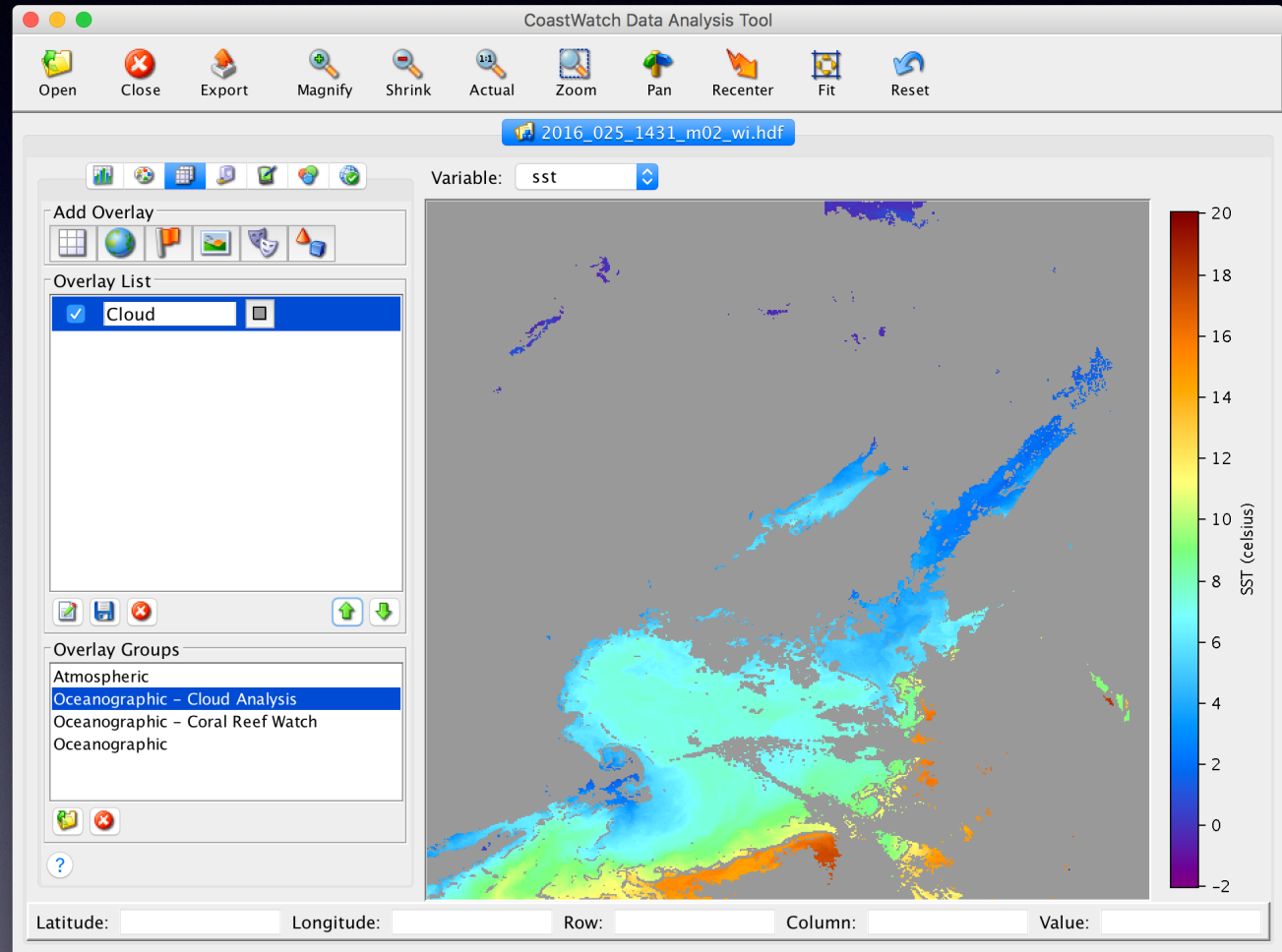
# Bit Masking

About the Software



Current Functionality

Development





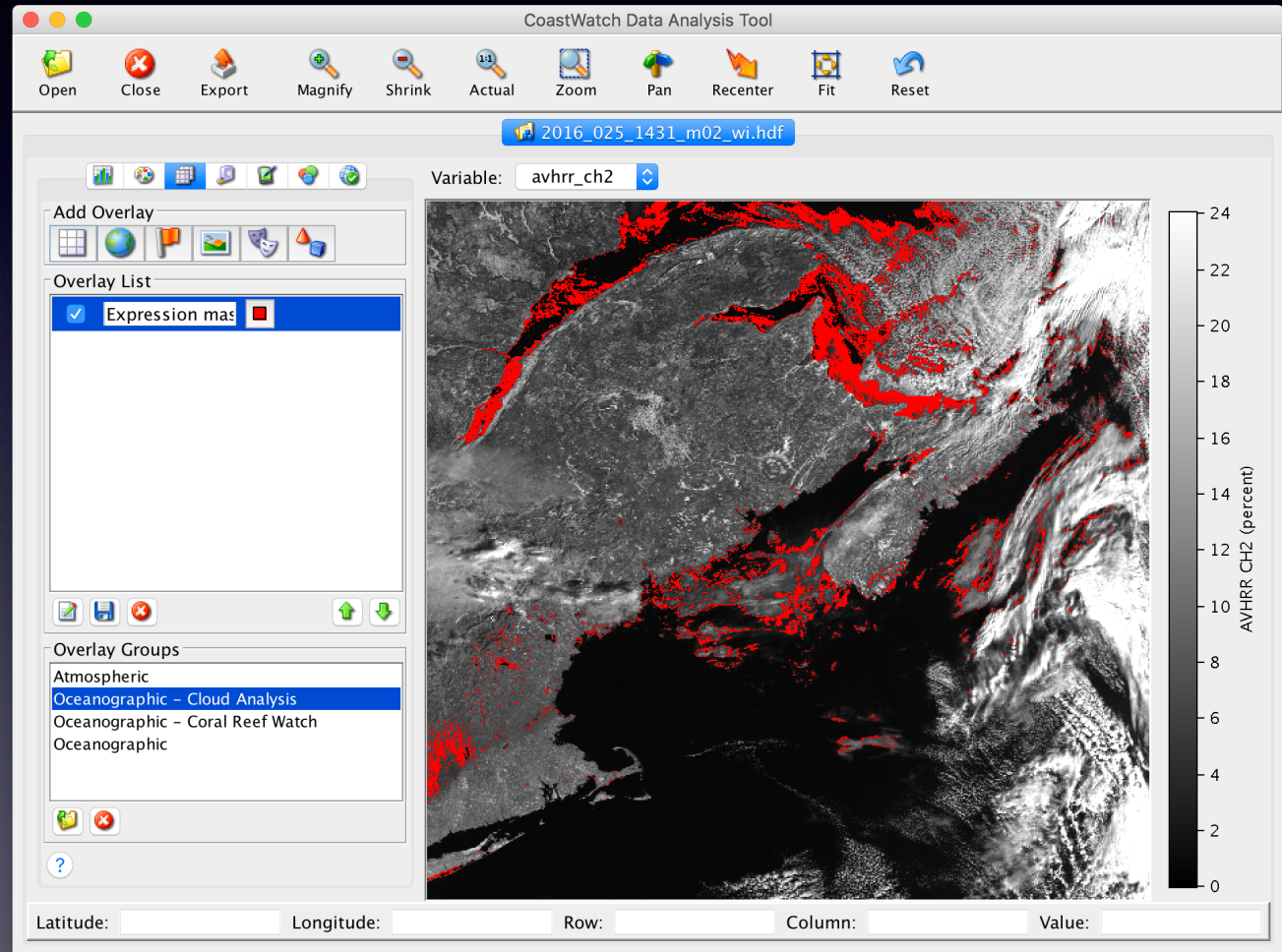
# Expression Masking

About the Software



Current Functionality

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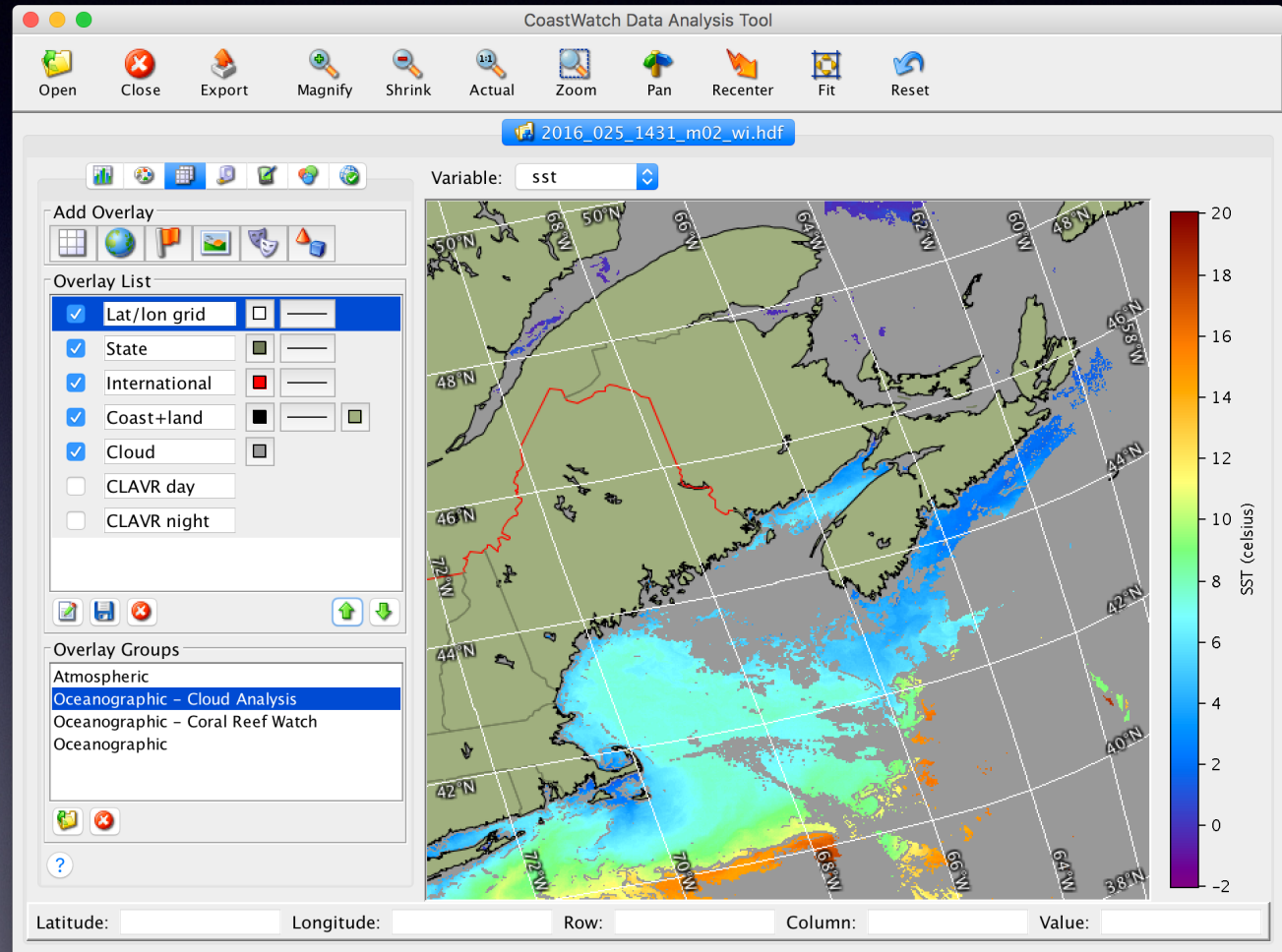
# Vector Overlays

About the Software



Current Functionality

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# File Contents

About the  
Software



Current  
Functionality

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```
Sample Images — -bash — 94x24
Exex:Sample Images phollema$ cwinfo 2016_024_1456_m02_mi.hdf
Contents of file 2016_024_1456_m02_mi.hdf

Global information:
  Satellite:      metop-2
  Sensor:        avhrr
  Date:          2016/01/24 JD 024
  Time:          14:56:06 UTC
  Scene time:    day/night
  Projection type: swath
  Origin:        USDOC/NOAA/NESDIS CoastWatch
  Format:        CoastWatch HDF version 3.4
  Reader ident:  noaa.coastwatch.io.CWHDFReader

Variable information:
  Variable      Type      Dimensions  Units      Scale  Offset
  swath_struct  byte     1331        -          -      -
  swath_bounds  double   42596       -          -      -
  swath_lat     double   47925       -          -      -
  swath_lon     double   47925       -          -      -
  avhrr_ch1     short    6000x2048   percent    0.01   0
  avhrr_ch2     short    6000x2048   percent    0.01   0
  avhrr_ch3     short    6000x2048   celsius    0.01   0
  avhrr_ch3a    short    6000x2048   percent    0.01   0
```



# Data Statistics

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```
Sample Images — -bash — 94x24
rel_azimuth  short  6000x2048  degrees  0.01  0
sat_zenith   short  6000x2048  degrees  0.01  0
sst          short  6000x2048  celsius  0.01  0
sun_zenith   short  6000x2048  degrees  0.01  0

Exex:Sample Images phollema$ cwstats --sample 0.01 2016_024_1456_m02_mi.hdf
Variable      Count  Valid  Min      Max      Mean      Stdev     Median
swath_struct   14     14     -101     108     -5.857143 69.481439 1.5
swath_bounds  426    426     0        5952.133 2986.628026 1728.605016 2999.5
swath_lat      480    480    -1032.669 2033.858 6.873492 114.423444 -0
swath_lon      480    480    -8050.79 16628.578 28.824881 892.041327 -0
[avhrr_ch1    123000 123000  0.65     84.59   14.489908 11.56327 10.52
avhrr_ch2     123000 123000  0.63     85.88   14.743629 11.234121 11.75
avhrr_ch3     123000 0       NaN      NaN     NaN       NaN       NaN
avhrr_ch3a    123000 123000 -0.07    53.46   11.415932 9.88044 8.42
avhrr_ch4     123000 123000 -69.06   31.65   -1.914139 17.144276 0.1
avhrr_ch5     123000 123000 -70.35   28.35   -2.960828 16.684404 -0.39
cloud          123000 114250  1        127     59.764604 44.122509 31
hrpt_header    6180   5999   3        1023    407.514586 372.950589 488
rel_azimuth    123000 123000 15.05    171.36  89.155044 54.499502 66.51
sat_zenith     123000 123000  0.28     68.65   32.384955 19.312518 31.85
sst            123000 123000 -69.7    47.69   1.265105 18.56652 2.2
sun_zenith     123000 123000 33.49    91.5    62.174362 11.896446 61.68
Exex:Sample Images phollema$
```



# Coverage Maps

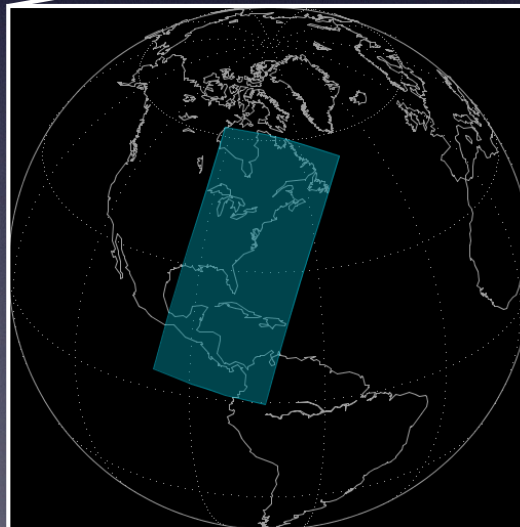
About the  
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```
Sample Images — -bash — 94x10
avhrr_ch4      123000  123000  -69.06   31.65   -1.914139  17.144276  0.1
avhrr_ch5      123000  123000  -70.35   28.35   -2.960828  16.684404 -0.39
cloud          123000  114250   1        127     59.764604  44.122509  31
hrpt_header    6180    5999     3        1023    407.514586 372.950589 488
rel_azimuth    123000  123000  15.05    171.36  89.155044  54.499502 66.51
sat_zenith     123000  123000  0.28     68.65   32.384955  19.312518 31.85
sst            123000  123000  -69.7    47.69   1.265105   18.56652   2.2
sun_zenith     123000  123000  33.49    91.5    62.174362  11.896446 61.68
[Exex:Sample Images phollemas$ cwcoverage 2016_024_1456_m02_mi.hdf cover.png
Exex:Sample Images phollemas$
```





# Registration

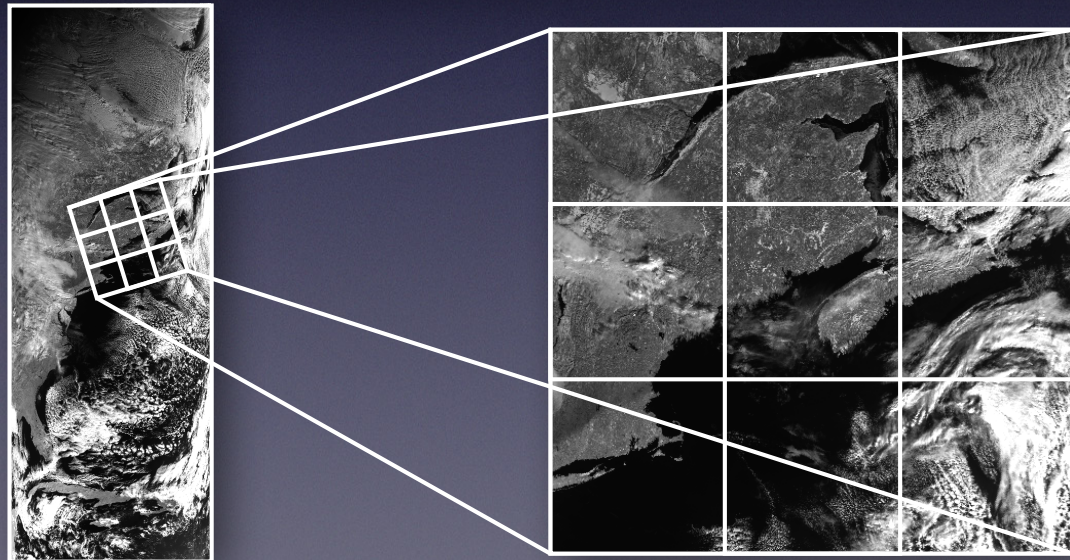
```
Sample Images — -bash — 94x10
[Exex:Sample Images phollema$ cwstringer -v east_coast.hdf 2016_024_1456_m02_mi.hdf reg.hdf ]
cwstringer: Reading master east_coast.hdf
cwstringer: Reading input 2016_024_1456_m02_mi.hdf
cwstringer: Creating output reg.hdf
cwstringer: Skipping non-grid variable swath_struct
cwstringer: Skipping non-grid variable swath_bounds
cwstringer: Skipping non-grid variable swath_lat
cwstringer: Skipping non-grid variable swath_lon
cwstringer: Adding avhrr_ch1 to resampled grids
cwstringer: Adding avhrr_ch2 to resampled grids
```

About the Software



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# Rendering

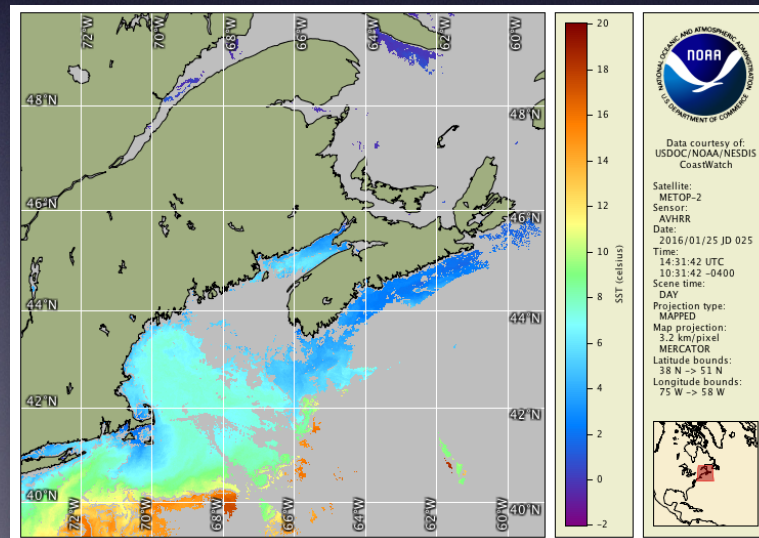
About the Software



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```
Sample Images — -bash — 94x10
[Exex:Sample Images phollema$ cwrender -v --cloud gray --grid white --coast black/land --enhance sst --range -2/20 --palette HSL256 reg.hdf reg_sst.png
cwrender: Reading input reg.hdf
EarthDataView: Preparing data image
EarthDataView: Rendering overlay noaa.coastwatch.render.BitmaskOverlay
EarthDataView: Rendering overlay noaa.coastwatch.render.CoastOverlay
EarthDataView: Rendering overlay noaa.coastwatch.render.LatLonOverlay
EarthImageWriter: Writing output reg_sst.png
[Exex:Sample Images phollema$
Exex:Sample Images phollema$
```





# Band Math

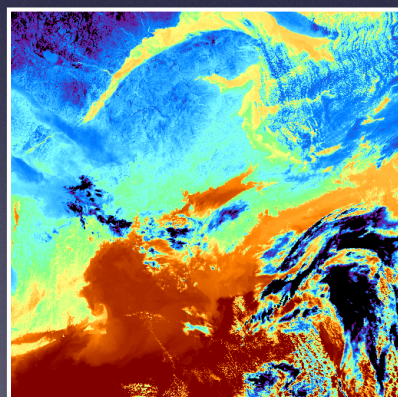
```
Sample Images — -bash — 94x10  
[Exex:Sample Images phollema$ cwmath -v --expr "diff45 = avhrr_ch4 - avhrr_ch5" reg.hdf reg_mat] h.hdf  
cwmath: Opening input reg.hdf  
cwmath: Creating output reg_math.hdf  
cwmath: Creating diff45 variable  
cwmath: Computing row 0  
cwmath: Computing row 100  
cwmath: Computing row 200  
cwmath: Computing row 300  
cwmath: Computing row 400
```

About the Software

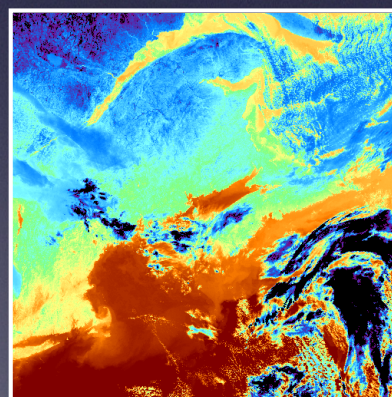


Current Functionality

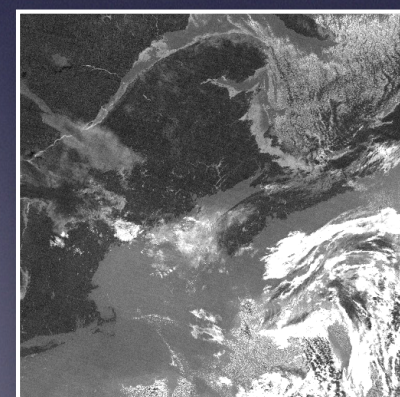
Development



-

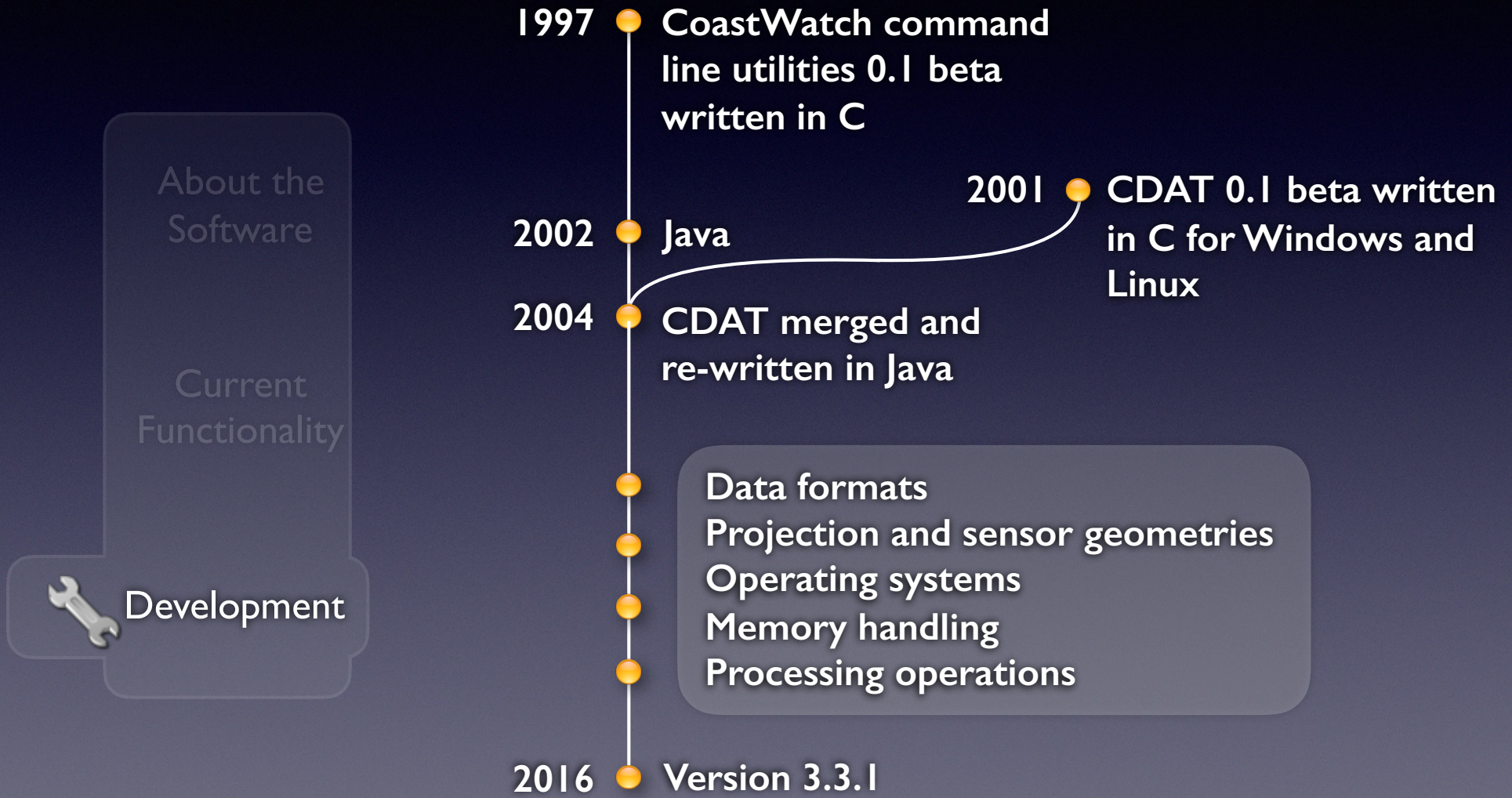


=



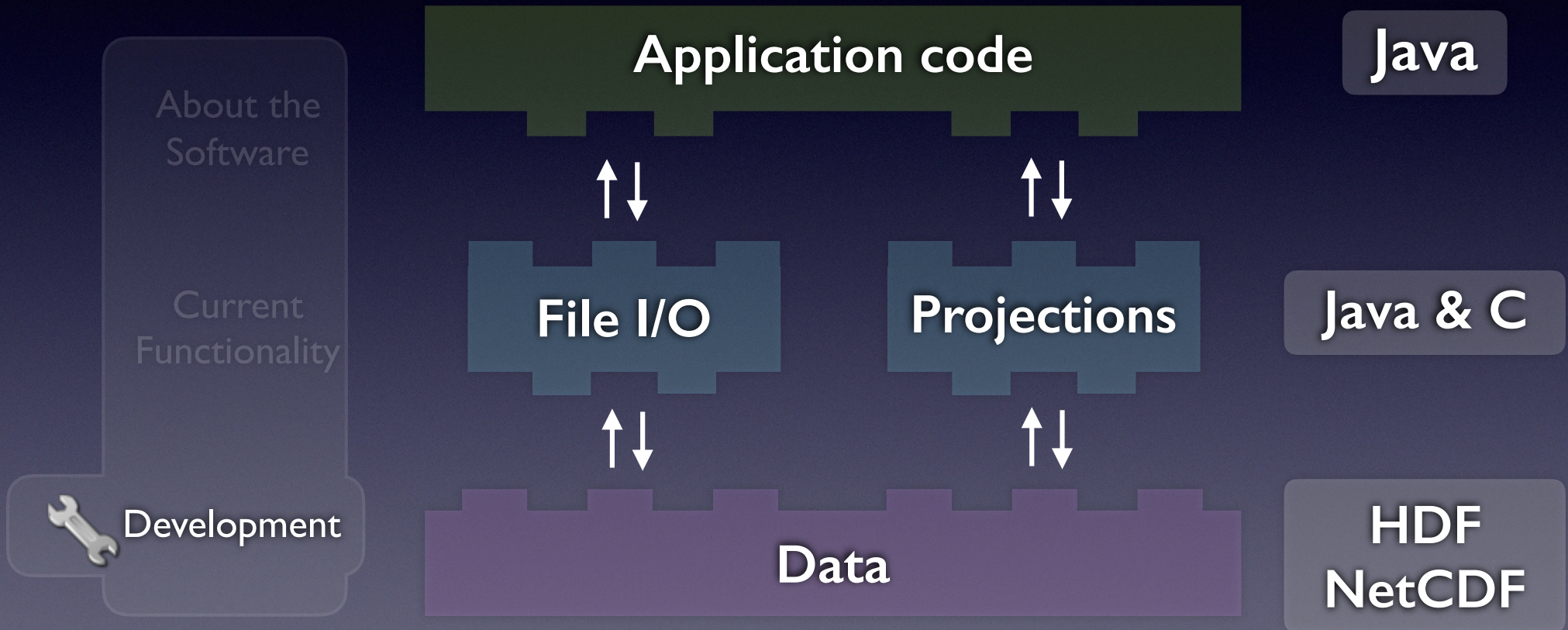


# History





# Architecture





# Requirements

About the  
Software

Current  
Functionality



Development

- CW nodes
- CW central operations
- Currently: NOAA/NESDIS  
ACSPO SST group



# In Progress (FY16)

About the  
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Development

- NetCDF grid mapped projections
- SST in-situ quality monitoring data handling in CDAT
- Data processing in CDAT
- Registration performance improvement



# Future

About the  
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Functionality



Development

- Improved NetCDF support (better handling of metadata flavours)
- More unit testing
- Adherence to object-oriented design patterns



# Summary

-  About the Software
-  Current Functionality
-  Development



# Acknowledgements

- NOAA/NESDIS ACSPO SST group
- CoastWatch central and node operations staff
- CoastWatch data users