# Sea_Ice_L2

## NPP_VICIP_L2

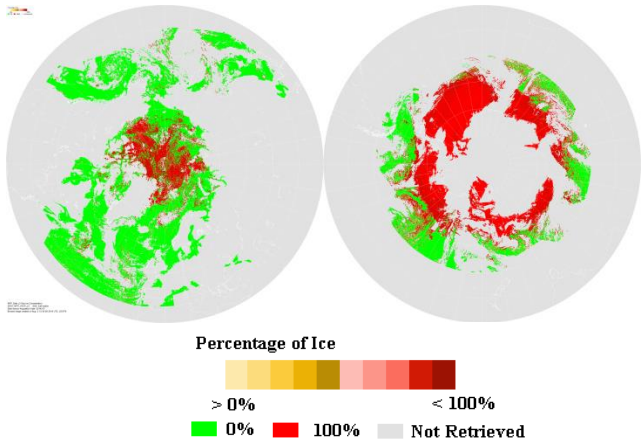
The VIIRS Ice Concentration is defined as the fraction of a given area of sea water covered by ice. The VIIRS Sea Ice Concentration IP consists of ice concentration at VIIRS Imagery spatial resolution (375 m at nadir), for both day and night, over oceans poleward of 36°N and 50°S latitude. There is no accuracy requirement for intermediate products.

The VIIRS imagery bands of I1 visible and I2 near infrared are input to the Ice Concentration Algorithm. The algorithm derives the ice fraction for ice pixels in the L2 swath using tie point analysis of surface temperature and surface reflectance. The algorithm outputs IPs for Ice Concentration and for Ice Reflectance and Temperature at 375m resolution.

The VIIRS Sea Ice Characterization (SIC) EDR uses the VIIRS Sea Ice Concentration intermediate product (IP) as a primary input. There is no heritage MODIS product for the SIC EDR. The Sea Ice Concentration IP is not a deliverable product, although we are evaluating its accuracy vs. MODIS sea ice extent products. The SIC EDR is an ice age classification map that contains classifications for Ice-free, New/Young Ice and All Other Ice categories. New/Young ice has a maximum thickness of 30cm, while All Other Ice is thicker than 30cm. The EDR does not include fresh-water ice and may also exclude some shore-fast ice areas, depending on the land mask used. It is produced both day and night over the oceans. The requirement for this EDR is 70% probability of correct typing. In addition to the ice concentration IP, the EDR also has dependencies on the surface temperature and surface reflectance IPs.

The VIIRS SIC algorithm is essentially a one-dimensional ice thickness model based on the surface energy budget. Inputs such as cloud properties, near surface wind speed, vapor pressure, surface temperature, albedo, and snow depth are used to solve the energy budget for ice thickness. The algorithm has a daytime (reflectance threshold) branch and a nighttime (energy balance) branch. The nighttime algorithm does not utilize albedo as input, relying more on the Ice Surface Temperature EDR to determine ice growth and subsequent thickness. The product does not have a heritage MODIS product (MODIS is ice extent only).

**Ice Fraction**



## Dimensions:

Along_Track:IceConcentration = 6144 ;
Along_Scan:IceConcentration = 6400 ;

## Variables:

float iceFraction(Along_Track:IceConcentration, Along_Scan:IceConcentration)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

float iceConcWeights(Along_Track:IceConcentration, Along_Scan:IceConcentration)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

# NPP_VIRTIP_L2

## Dimensions:

Along_Track:IceConc_ReflectanceTemperature_IP = 6144
Along_Scan:IceConc_ReflectanceTemperature_IP = 6400

## Variables:

float iceTiePointsI1(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

float iceTiePointsI2(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

float iceTiePointsST(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:....NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

float localWaterTiePointsI1(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

float localWaterTiePointsI2(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

float localWaterTiePointsST(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

byte QF1_VIIRSIREFLTEMPIP(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:..._INT8_FILL = 127
MISS_INT8_FILL = 126
ONBOARD_PT_INT8_FILL = 125
ONGROUND_PT_INT8_FILL = 124
ERR_INT8_FILL = 123
ELLIPSOID_INT8_FILL = 122
VDNE_INT8_FILL = 121
SOUB_INT8_FILL = 120

byte QF2_VIIRSIREFLTEMPIP(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES;...NA_INT8_FILL = 127
MISS_INT8_FILL = 126
ONBOARD_PT_INT8_FILL = 125
ONGROUND_PT_INT8_FILL = 124
ERR_INT8_FILL = 123
ELLIPSOID_INT8_FILL = 122
VDNE_INT8_FILL = 121
SOUB_INT8_FILL = 120

byte QF3_VIIRSIREFLTEMPIP(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_INT8_FILL = 127
MISS_INT8_FILL = 126
ONBOARD_PT_INT8_FILL = 125
ONGROUND_PT_INT8_FILL = 124
ERR_INT8_FILL = 123
ELLIPSOID_INT8_FILL = 122
VDNE_INT8_FILL = 121
SOUB_INT8_FILL = 120

byte QF4_VIIRSIREFLTEMPIP(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_INT8_FILL = 127
MISS_INT8_FILL = 126
ONBOARD_PT_INT8_FILL = 125
ONGROUND_PT_INT8_FILL = 124
ERR_INT8_FILL = 123
ELLIPSOID_INT8_FILL = 122
VDNE_INT8_FILL = 121
SOUB_INT8_FILL = 120

byte QF5_VIIRSIREFLTEMPIP(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_INT8_FILL = 127
MISS_INT8_FILL = 126
ONBOARD_PT_INT8_FILL = 125
ONGROUND_PT_INT8_FILL = 124
ERR_INT8_FILL = 123
ELLIPSOID_INT8_FILL = 122
VDNE_INT8_FILL = 121
SOUB_INT8_FILL = 120

byte QF6_VIIRSIREFLTEMPIP(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_INT8_FILL = 127
MISS_INT8_FILL = 126
ONBOARD_PT_INT8_FILL = 125
ONGROUND_PT_INT8_FILL = 124
ERR_INT8_FILL = 123
ELLIPSOID_INT8_FILL = 122
VDNE_INT8_FILL = 121
SOUB_INT8_FILL = 120

byte QF7_VIIRSIREFLTEMPIP(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_INT8_FILL = 127
MISS_INT8_FILL = 126
ONBOARD_PT_INT8_FILL = 125
ONGROUND_PT_INT8_FILL = 124
ERR_INT8_FILL = 123
ELLIPSOID_INT8_FILL = 122
VDNE_INT8_FILL = 121
SOUB_INT8_FILL = 120

byte QF8_VIIRSIREFLTEMPIP(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_INT8_FILL = 127
MISS_INT8_FILL = 126
ONBOARD_PT_INT8_FILL = 125
ONGROUND_PT_INT8_FILL = 124
ERR_INT8_FILL = 123
ELLIPSOID_INT8_FILL = 122
VDNE_INT8_FILL = 121
SOUB_INT8_FILL = 120

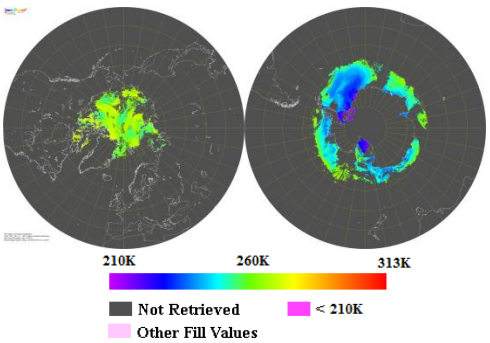
byte QF8_VIIRSIREFLTEMPIP(Along_Track:IceConc_ReflectanceTemperature_IP,
Along_Scan:IceConc_ReflectanceTemperature_IP)

FILL_VALUES:...NA_INT8_FILL = 127
MISS_INT8_FILL = 126
ONBOARD_PT_INT8_FILL = 125
ONGROUND_PT_INT8_FILL = 124
ERR_INT8_FILL = 123
ELLIPSOID_INT8_FILL = 122
VDNE_INT8_FILL = 121
SOUB_INT8_FILL = 120

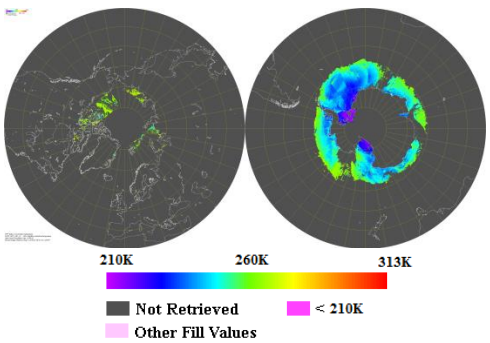
# NPP_VIST_L2

The Ice Surface Temperature 375m Algorithm derives the temperature of the ice surface at VIIRS imagery resolution for use as input to VIIRS algorithms that process ice pixels at 375m resolution. It is needed to complement the Ice Surface Temperature EDR at 750m that is used by the Snow/Ice Algorithm. The Ice Surface Temperature 750m Algorithm derives the surface temperature over snow and ice except for very cloudy scenes. It is based on water vapor correction algorithms and uses a regression equation to determine the skin ice surface temperature at 750m resolution.

**Ice Surface Temperature-Daytime**




**Ice Surface Temperature-Nighttime**




## Dimensions:

Along_Track:IceSurfaceTemperature = 3072 ;
Along_Scan:IceSurfaceTemperature = 3200 ;

## Variables:

short IceSurfaceTemperature(Along_Track:IceSurfaceTemperature,
Along_Scan:IceSurfaceTemperature)

Scale = 0.0014009493f
Offset = 183.2f

FILL_VALUES:...NA_UINT16_FILL = 65535
MISS_UINT16_FILL = 65534
ONBOARD_PT_UINT16_FILL = 65533
ONGROUND_PT_UINT16_FILL = 65532
ERR_UINT16_FILL = 65531
ELLIPSOID_UINT16_FILL = 65530
VDNE_UINT16_FILL = 65529
SOUB_UINT16_FILL = 65528

byte QF1_VIIRSISTEDR(Along_Track:IceSurfaceTemperature, Along_Scan:IceSurfaceTemperature)

FILL_VALUES:...NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF2_VIIRSISTEDR(Along_Track:IceSurfaceTemperature,
Along_Scan:IceSurfaceTemperature)

FILL_VALUES:NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF3_VIIRSISTEDR(Along_Track:IceSurfaceTemperature,
Along_Scan:IceSurfaceTemperature)

FILL_VALUES:...NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248" ;

# NPP_VIWIP_L2

Dimensions:

Along_Track:IceQuality_Weight = 6144 ;
Along_Scan:IceQuality_Weight = 6400 ;

Variables:

float iceWeights_0(Along_Track:IceQuality_Weight, Along_Scan:IceQuality_Weight)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

float iceWeights_1(Along_Track:IceQuality_Weight, Along_Scan:IceQuality_Weight)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

float iceWeights_2(Along_Track:IceQuality_Weight, Along_Scan:IceQuality_Weight)

FILL_VALUES:...NA_FLOAT32_FILL = -999.
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6

# NPP_VIQIP_L2

Dimensions:

Along_Track:IceQuality_Mask = 6144 ;
Along_Scan:IceQuality_Mask = 6400 ;

Variables:

byte QF1_VIIRSIceQualityIP(Along_Track:IceQuality_Mask, Along_Scan:IceQuality_Mask)

granuleNotInSeaIceRange = '\0
granuleNotInFWIceRange = '\1

FILL_VALUES:...NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF2_VIIRSIceQualityIP(Along_Track:IceQuality_Mask, Along_Scan:IceQuality_Mask)

granuleNotInSeaIceRange = '\0
granuleNotInFWIceRange = '\1

FILL_VALUES:...NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF3_VIIRSIceQualityIP(Along_Track:IceQuality_Mask, Along_Scan:IceQuality_Mask)

granuleNotInSeaIceRange = '\0
granuleNotInFWIceRange = '\1

FILL_VALUES:...NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253

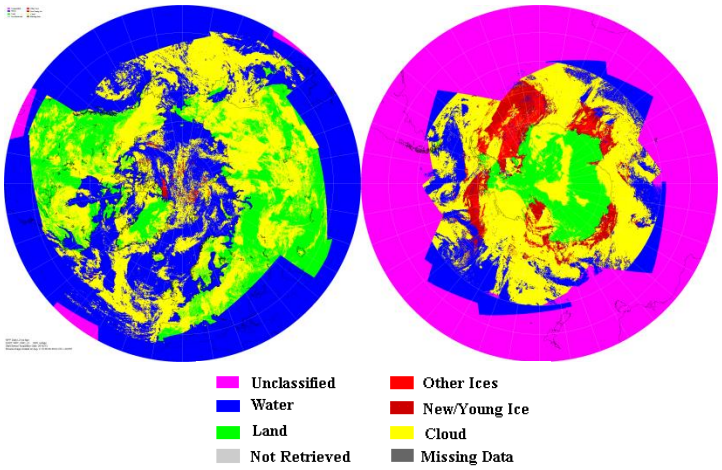
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 24

# NPP_VSIC_L2

Sea Ice Age is best determined by microwave retrievals, but the results are only completely reliable for clear sky scenes. An automatic digital retrieval of sea ice age from any visible/infrared instrument is not possible.

The Sea Ice Age algorithm produces a Sea Ice Age EDR product. The Sea Ice Age EDR is used to report on "Ice free", "New/Young", and "All other ice" classifications at an aggregated cell size of 2x2 VIIRS imagery pixels. Due to the 2x2 imagery pixel aggregation, the Ice Age EDR product size is equal to moderate resolution product size, therefore, the algorithm produces no geolocation product. The Moderate Resolution VIIRS SDR GEO product should be used whenever geolocation data is required for Ice Age EDR data".

**Ice Age**




## Dimensions:

Along_Track_HCROWS:SeaIceAge = 3072 ;
Along_Scan_HCCOLS:SeaIceAge = 3200 ;

## Variables:

float IceAgeWeight(Along_Track_HCROWS:SeaIceAge, Along_Scan_HCCOLS:SeaIceAge)

FILL_VALUES:...NA_FLOAT32_FILL = -999.9
MISS_FLOAT32_FILL = -999.8
ONBOARD_PT_FLOAT32_FILL = -999.7
ONGROUND_PT_FLOAT32_FILL = -999.6
ERR_FLOA32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2

byte IceAge(Along_Track_HCROWS:SeaIceAge, Along_Scan_HCCOLS:SeaIceAge)

FILL_VALUES:...NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF1_VIIRSSICEDR(Along_Track_HCROWS:SeaIceAge, Along_Scan_HCCOLS:SeaIceAge)

FILL_VALUES:...NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248

byte QF2_VIIRSSICEDR(Along_Track_HCROWS:SeaIceAge, Along_Scan_HCCOLS:SeaIceAge)

FILL_VALUES:...NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248" ;

byte QF3_VIIRSSICEDR(Along_Track_HCROWS:SeaIceAge, Along_Scan_HCCOLS:SeaIceAge)

FILL_VALUES:...NA_UINT8_FILL = 255
MISS_UINT8_FILL = 254
ONBOARD_PT_UINT8_FILL = 253
ONGROUND_PT_UINT8_FILL = 252
ERR_UINT8_FILL = 251
ELLIPSOID_UINT8_FILL = 250
VDNE_UINT8_FILL = 249
SOUB_UINT8_FILL = 248
ERR_FLOAT32_FILL = -999.5
ELLIPSOID_FLOAT32_FILL = -999.4
VDNE_FLOAT32_FILL = -999.3
SOUB_FLOAT32_FILL = -999.2