Drift+Noise IceMap Interpretation Guidelines

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Contents

1 General Usage Instructions

- Operational ice maps show either of three different data sources: A radar image, an optical images or a sea-ice concentration map. Each data with their own advantages and disadvantages. An interpretation of all three data together is the best way to avoid misinterpretation.
- The recording time of the presented data is printed on each ice map.
- The pixel resolution of the displayed data is indicated on each ice map.
- If you require more assistance than provided in this document in interpretation of ice maps, please don't hesitate to contact us under support@driftnoise.com.

2 Sea-ice concentration information

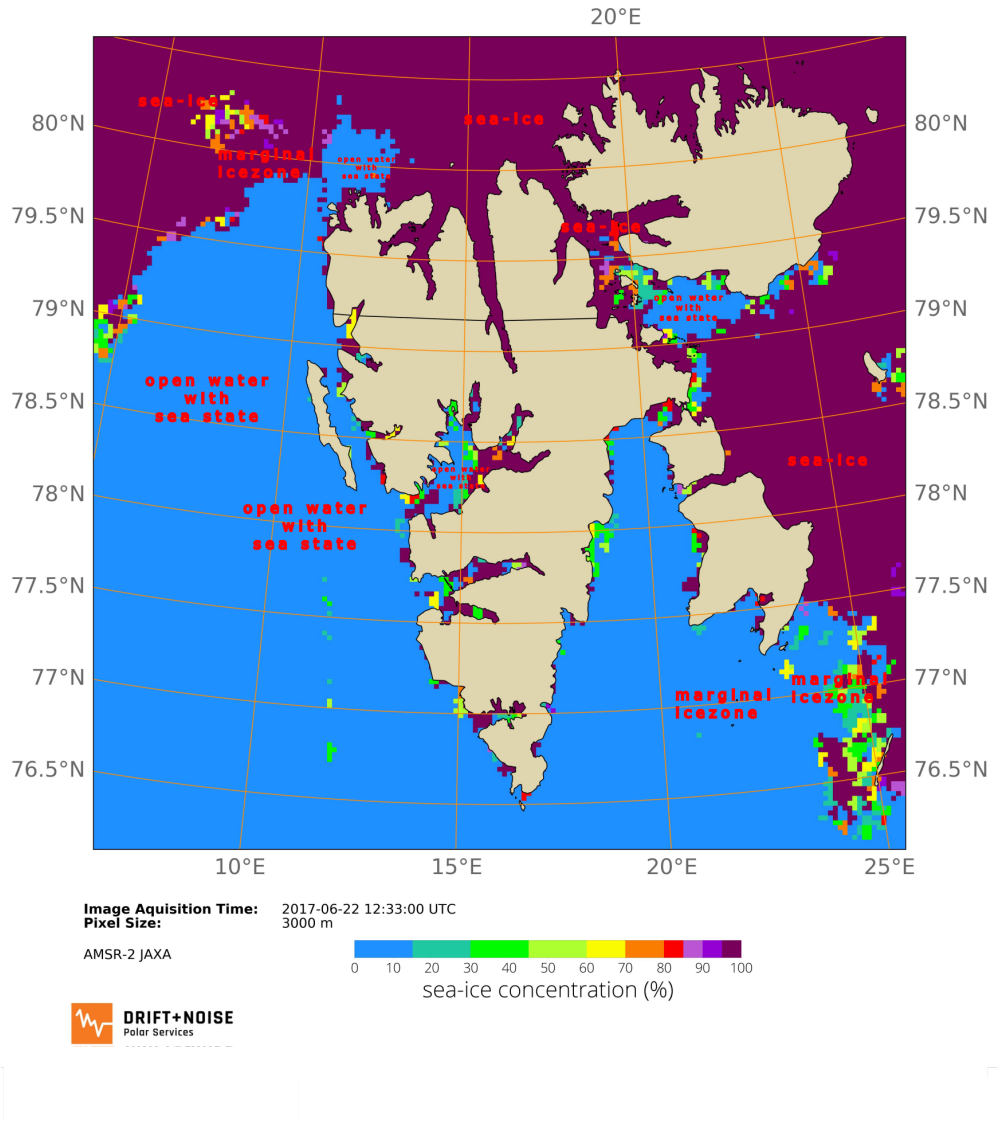

Figure 1: Sea-ice concentration map. Note the marginal ice zone in the south east, which is not visible on the sea-ice concentration map, however can be seen on the optical image.

- Sea-ice concentration information is a valuable dataset for strategical planning and an **excellent interpretation help for radar and optical images**.
- The colour of each pixel reflects an area percentage covered with sea-ice.

- These data have a **pixel resolution of 3.125 km** and are updated several times a day, worldwide.
- It is the coarsest data set in the operational ice maps, no structures smaller than 3.125 km are resolved with sea-ice concentration.
- **Sea-ice concentration does not indicate the type of ice.** A 100% ice cover might be old multi-year ice, first-year ice or even a thin refrozen ice layer only. To clarify this, use additional radar and optical images and/or ice charts, if available.
- Lower sea-ice concentrations might reflect areas with freely drifting ice floes. **Caution: A sea-ice concentration of 0% might still cover a significant amount of ice floes** if floes size is small and/or the ice is in a melting stage. You will not encounter a closed ice cover, but enough ice so that you must slow down an ice class vessel significantly. To clarify this, use additional radar and optical images.
- Generally, the error is around 10%. Close to the coast ($\approx$ 5 nm) errors can be significantly higher. I.e. **sea-ice concentration is not trustworthy at the coast and in fjords**. Even a totally ice-free coast will show pixels with ice concentration.

3 MODIS optical images

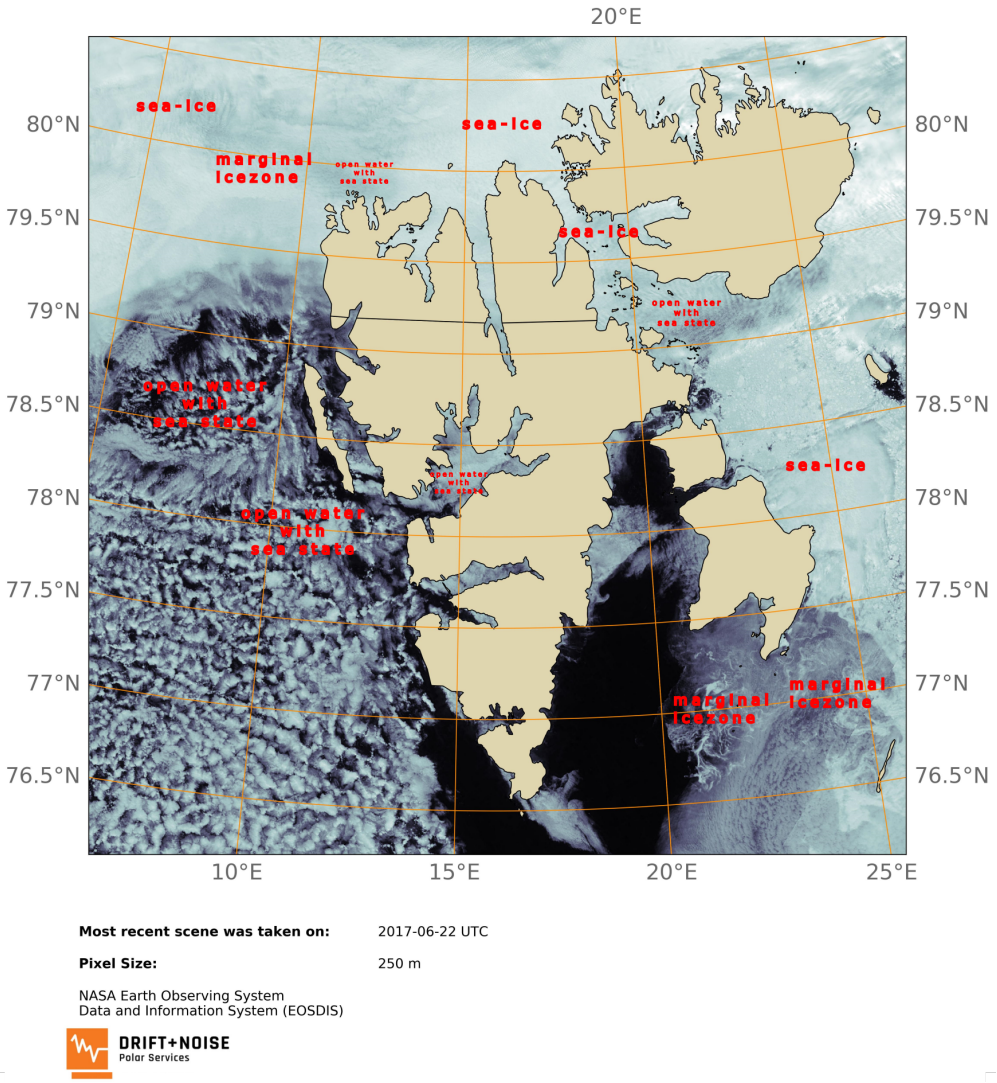

Figure 2: MODIS optical image. The northern zone is too cloudy for any interpretation, but the radar and sea-ice concentration maps helped out on these positions.

- These data have a **maximum resolution of 250 m** and are updated daily, worldwide.
- No structures smaller than 250 m are resolved.
- The biggest advantage of optical data is, that it shows the earth surface as we would see it. **It is basically a photograph of the earth**.

- The biggest disadvantage is, that the **earth surface might be masked with clouds** and you cannot use these data in the polar night.
- A **discrimination between clouds and ice is not always straightforward**. Use sea-ice concentration and radar images as an interpretation aid. Hint: If you compare two subsequent optical images of the same region, clouds change from day to day considerably, ice, in relation to the clouds, much less.
- Look for familiar ice floe structures to identify ice. Look for familiar cloud structures to identify clouds.
- Sometimes the cloud cover is thin enough and fog like, so that the **ice on the ocean might shimmer through**.

4 Sentinel-1 radar images

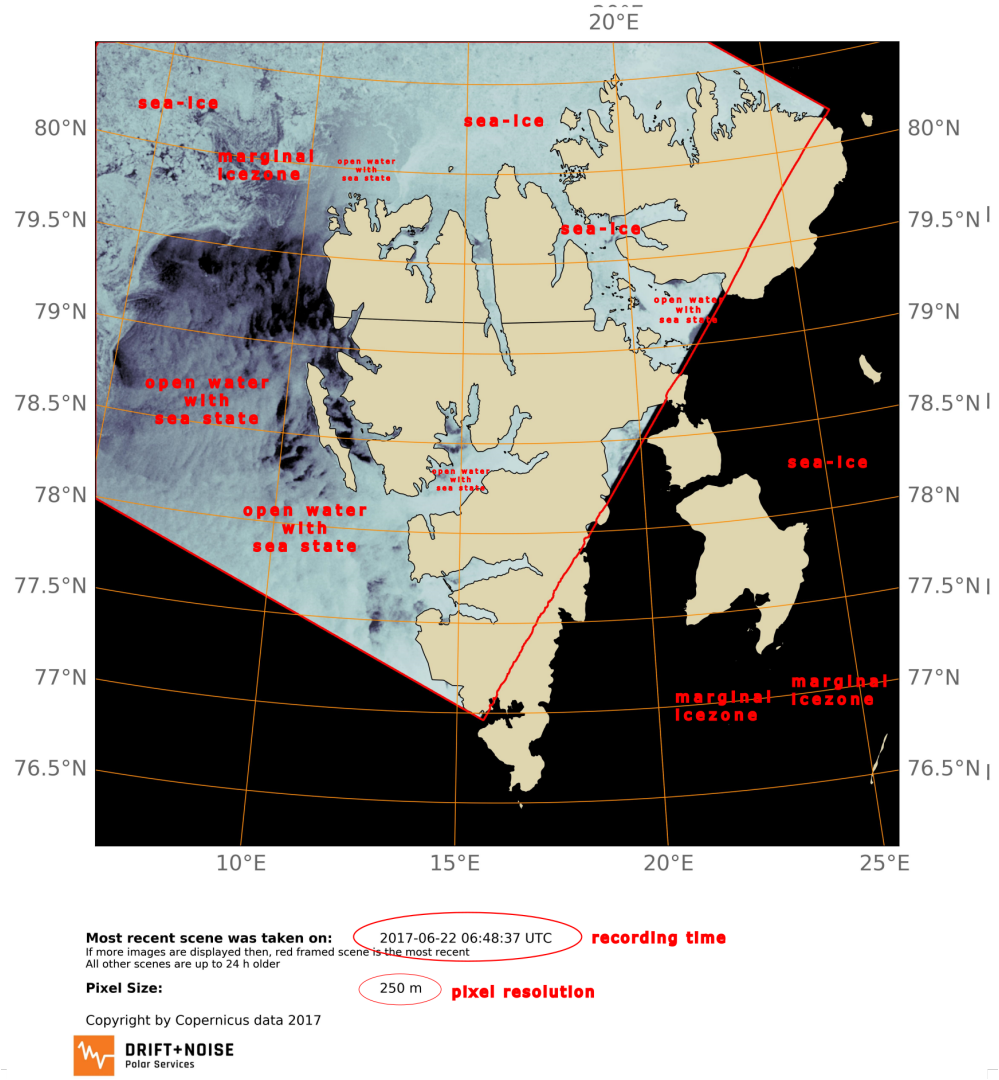

Figure 3: Sentinel-1 radar image with interpretation aids. No recording was available for the region with the black background. However, information for these areas is available on the sea-ice concentration and optical maps.

- Within the operational ice maps, Sentinel-1 radar images are the most valuable data set.
- Resolution of the data ranges from **30 m for small observation areas up to 250 m for**

larger areas. The actual resolution is printed on the operational ice map.

- No structure smaller than the indicated resolution is resolved.
- Biggest advantage of radar data is, that **they penetrate clouds**. I.e. you will never see clouds on the image, **every structure displayed is a feature of the ocean or ice surface**.
- Another advantage is, that **radar images show the structure of the ice**. It might be possible, for the experienced user, to discriminate old from young ice from open cracks in the ice cover.
- Biggest disadvantage is, that the appearance of ice and ocean in the same region might change from snapshot to snapshot. **This makes interpretation sometimes difficult. Always use additional sea-ice concentration and optical images as an interpretation aid**.
- Some general rules for interpretation
  - **Always use additional sea-ice concentration and optical images as an interpretation aid**.
  - These aids might always find its exception.
  - **Ice appears brighter than calm water**.
  - **Water with sea state appears brighter than calm water**.
  - **Discriminating sea state from ice might be difficult**. Look for familiar ice floe structures to identify ice.
  - If a large bright area shows no ice on the sea-ice concentration map or the optical image, it is probably sea state and not ice. **Caution:** Even if the sea-ice concentration shows no ice, but the radar image shows bright snake-like structures (not bright large areas), this might be free drifting ice floes anyway. Check if you see the snake like structures on the optical images as well, if yes, these are ice floes.
  - Ice with a wet surface (melting conditions in summer) might appear dark instead of bright.
- Sentinel-1 radar images are not available daily everywhere. In the European Arctic (e.g. Svalbard) you can expect up to to 2 or 3 updates a day. In the Canadian Arctic and in Greenland or in Antarctica only every 1-3 days one delivery.