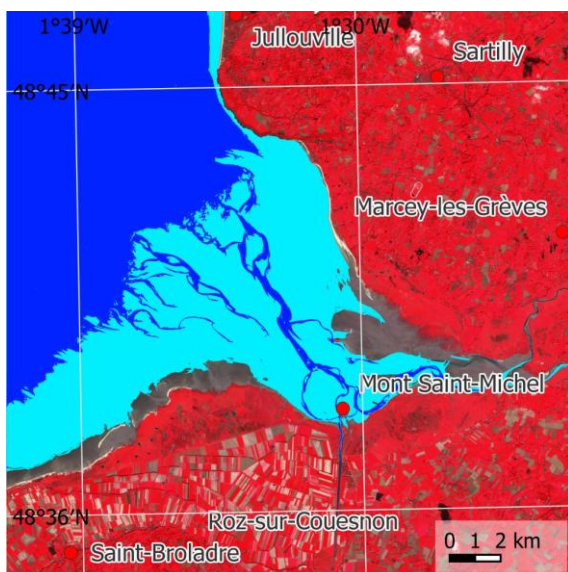




2025-03-06, Sentinel-2 (flood tide).



2024-09-17, Sentinel-2 (ebb tide).



Sea surface 2025-03-06 (light blue) and 2024-09-17 (blue).

Mont Saint-Michel: Nature Use and Protection

With its roots dating back to the 9th century, the UNESCO World Heritage Site Mont Saint-Michel in Normandy, France, is famous for its medieval abbey and its unique tidal environment. It attracts approximately 3 million visitors annually, making it one of the country's most popular tourist destinations outside of Paris.

The surrounding bay is renowned for its **oyster farming**, particularly in the nearby town of Cancale, sometimes referred to as the "oyster capital" of Brittany. The nutrient-rich waters of Mont Saint-Michel Bay provide an ideal environment for oyster cultivation. With an annual production of approximately 130,000 tons, France is the leading European producer of oysters.

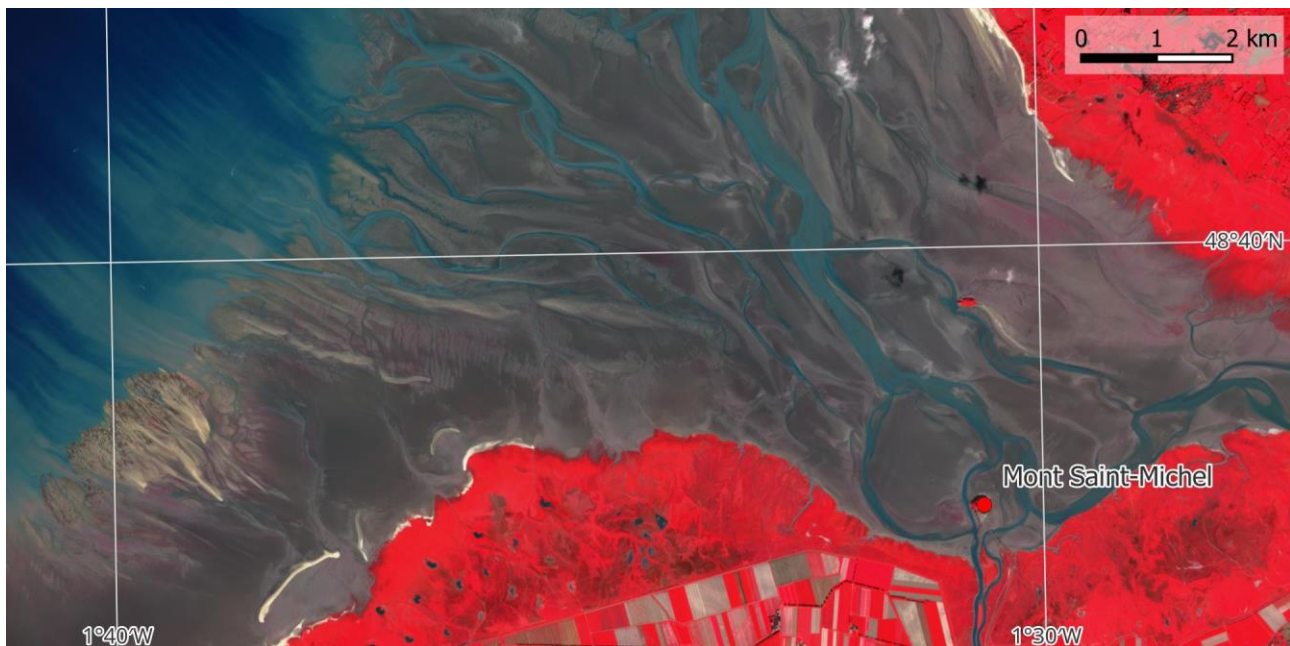
The rocky island of Mont Saint-Michel is connected to the mainland by a causeway and is surrounded by vast sandbanks and tidal flats. The tides here are among the highest in Europe, with the sea retreating kilometres before rushing back in. This dynamic environment is similar to the Wadden Sea, a vast coastal ecosystem stretching along the Netherlands, Germany, and Denmark.

The flat coastal area consists of **intertidal zones**, **salt marshes**, and **mudflats**. It is one of the world's most important ecosystems for migratory birds, providing a rich feeding ground. The coastal area changes dramatically with the tides, creating a unique and fragile habitat.

To protect these landscapes, integrated nature conservation strategies are used. At Mont Saint-Michel, efforts have been made to restore natural tidal flows by removing human-made structures that caused sediment buildup, specifically a dam that connected the island with the mainland.

Earth observation technology plays a key role in monitoring these ecosystems. Satellites track coastline changes, water levels, and biodiversity. This data helps scientists understand the impact of climate change, such as rising sea levels and habitat shifts. Remote sensing also detects pollution and human impact, allowing for better conservation planning.





2024-09-17, Sentinel-2, false colour infrared (ebb tide). The image shows the drainage pattern in the floodplain. Faint lines in the upper left indicate the locations of oyster cultures.

Exercises

- Look at the two Sentinel-2 satellite images in true colour and try to identify areas with different land cover and landuse. Can you see built-up areas, coastal vegetation, and water bodies?
- Compare these two images and try to identify differences. What are the most striking differences on land and in the sea, respectively? Which reasons can you identify for the differences? Think about the role of seasons in agriculture and, for the sea surface, of the tides.
- Look at the false colour infrared image with the water surface layers. Use the distance bar to estimate the distance between Mont Saint-Michel and the water line during ebb tide.
- Try to estimate the difference of the areas covered during flood tide and ebb tide. Hint: use the distance bar to estimate the area in light blue.
- Can you identify the faint lines of the oyster cultures in the last image? Where are they placed and why?



Additional Material



Mont Saint-Michel during ebb tide (left), Oyster cultures (right) (photographs: M. Eisl)

Links and Sources

- https://www.esa.int/Applications/Observing_the_Earth/Earth_from_Space_Tidal_island - ESA Applications article about Mont Saint-Michel in an image taken by the Pleiades satellite.
- https://www.esa.int/ESA_Multimedia/Images/2012/07/Mont_Saint_Michel - Pleiades satellite image detail of Mont Saint-Michel.
- https://www.esa.int/ESA_Multimedia/Videos/2018/05/Earth_from_Space_Mont_Saint-Michel - ESA Video highlighting a Sentinel-2 image of the Mont Saint-Michel bay area.
- https://www.esa.int/Applications/Observing_the_Earth/Earth_from_Space_Western_France - Brittany and Normandy in a large-area Envisat MERIS image.

