



Blue-Cloud

Piloting innovative services for Marine Research & the Blue Economy



Royal Netherlands
Meteorological Institute
*Ministry of Infrastructure
and Water Management*

Demonstrator on Marine Environmental Indicators

Storm Severity Index (SSI)

4 December 2020, Jan Willem Noteboom, KNMI



Storm Severity Index (SSI)

- Purpose : storm severity indicator for an area and time period.
- Data source : C3S ERA5 data (hourly reanalysis 10 m wind data above sea)
- Derived data source : daily and monthly SSI grid data (now limited to 1987–1989, Med. Sea)

$$SSI_{\text{grid (k,daily or monthly)}} = \sum_{t=1}^T \left[\left(\max \left(0, \frac{v_t}{v_{\text{threshold}}} - 1 \right) \right)^3 \right]$$

$SSI_{\text{grid (k, daily or monthly)}}$: monthly or daily grid cells (31x31 km)
 T : daily hours (24) or monthly hours
 $V_{\text{threshold}}$: no impact below this wind speed

- User interface (*integration to be done*):
 1. select daily or monthly SSI grid (source data)
 2. select area and time period (in days or months)
 3. calculate SSI distribution map and SSI total score (method/process) and visualize map (view)

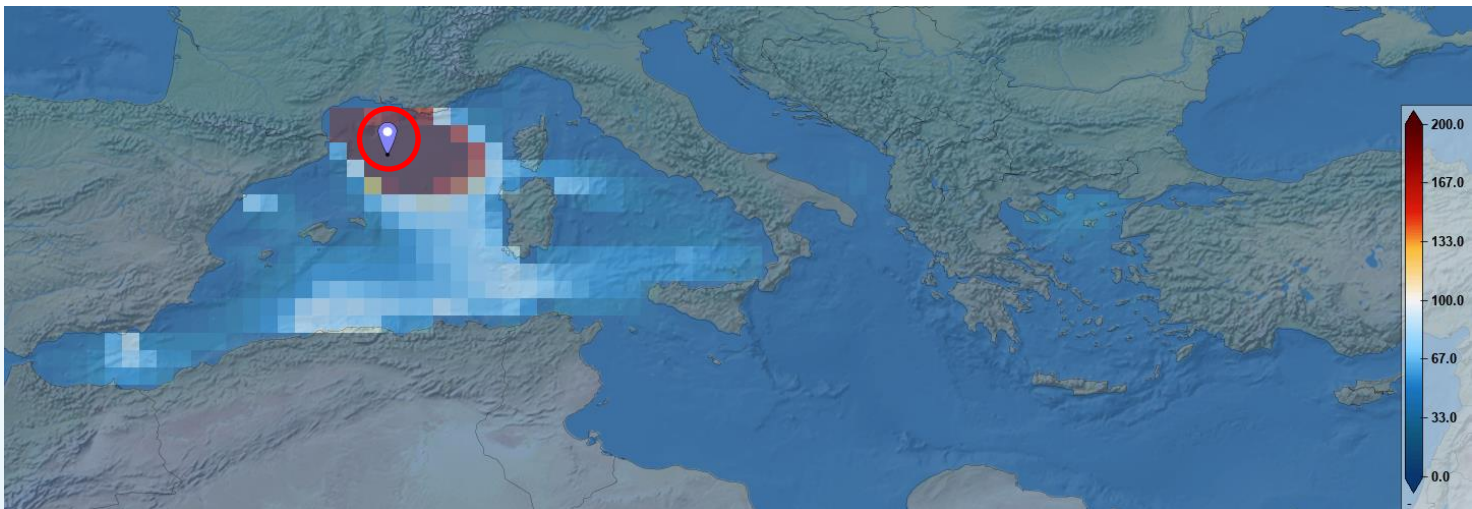
$$SSI_{\text{distribution ,k}} = \sum_{t=1}^T SSI_{t,k} \quad SSI_{\text{score}} = \sum_{k=1}^K \sum_{t=1}^T SSI_{t,k}$$

$SSI_{\text{distribution,k}}$: k selected grid cells
 SSI_{score} : sum of all k selected grid cells
 T : nr of days or nr of months

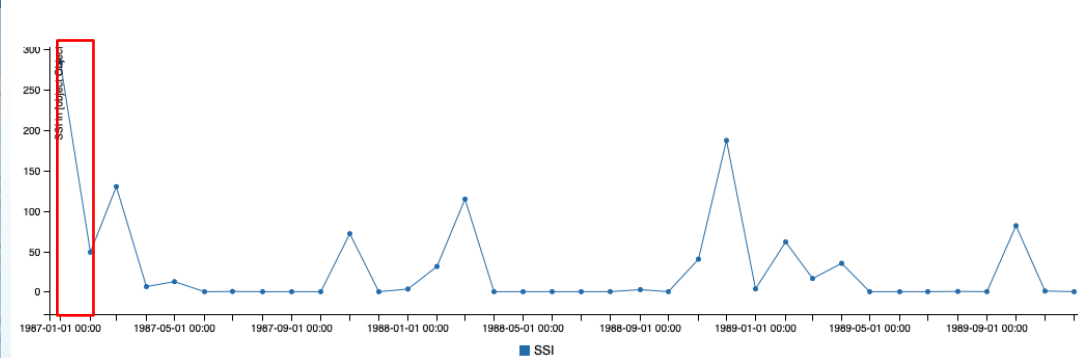
Examples of SSI applications

- To study the severity of an individual storm (impact on sea circulation)
- To study an entire storm season (winter) of a sea area
- To study storm climatology of a sea area (is there a severity increase)
E.g. SSI of Med.Sea over 30 years in total: 1980 – 2010 versus 1990 -2020
- More...

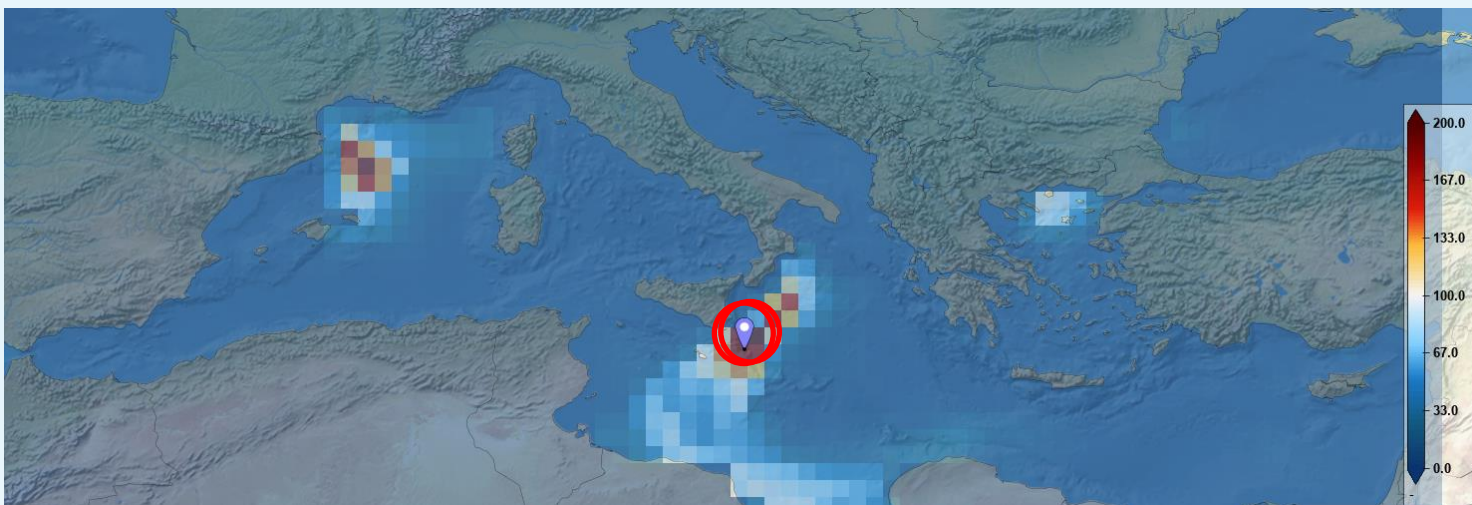
Monthly SSI maps (from 1987-1989)



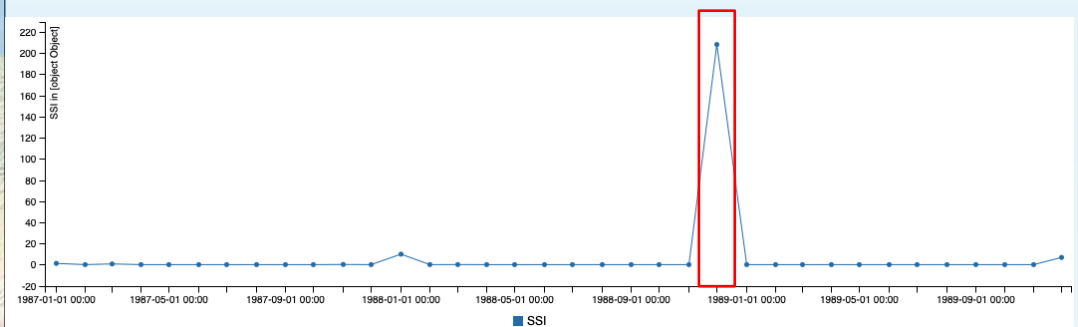
Jan 1987



Monthly SSI timeseries 1987 - 1989

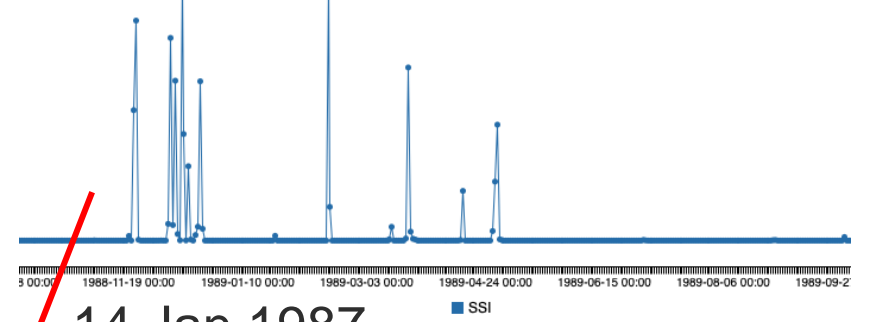


Dec 1988



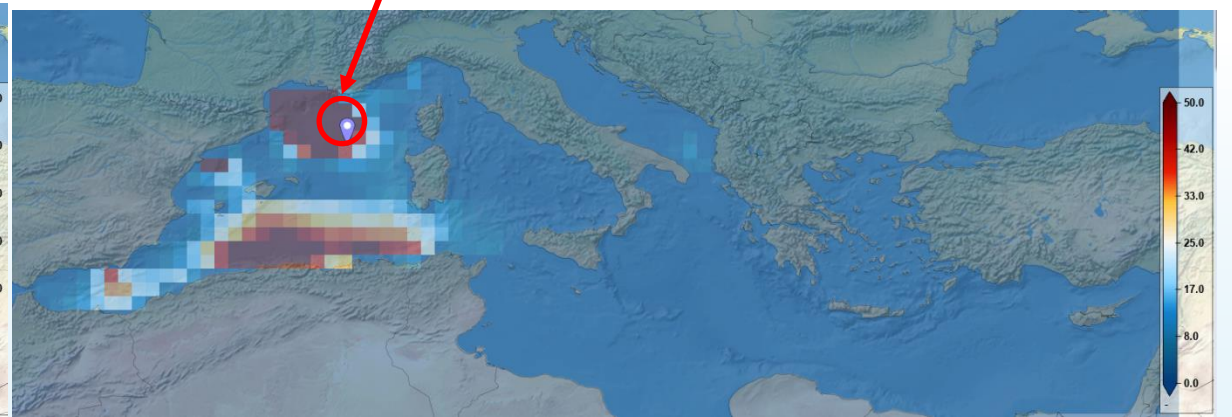
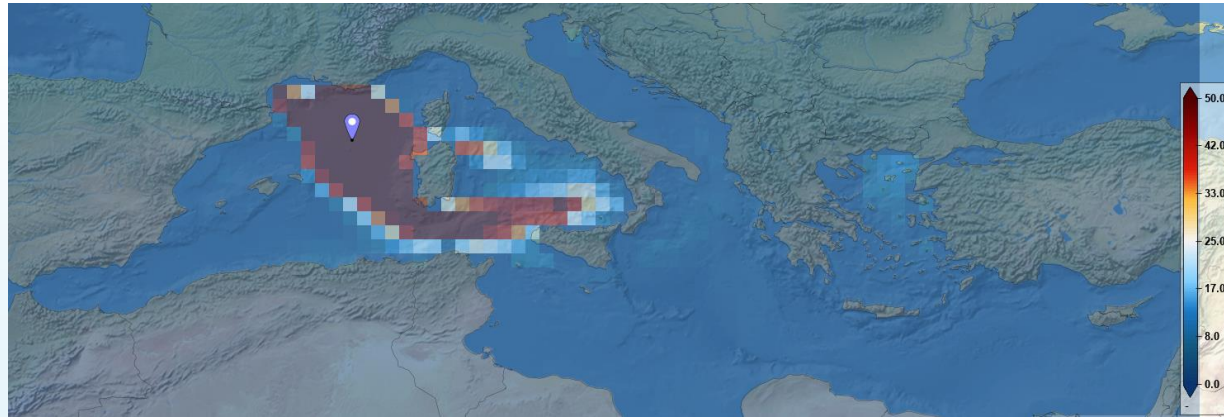
Daily SSI Maps

Daily SSI timeserie Sep 88 – Sep 89



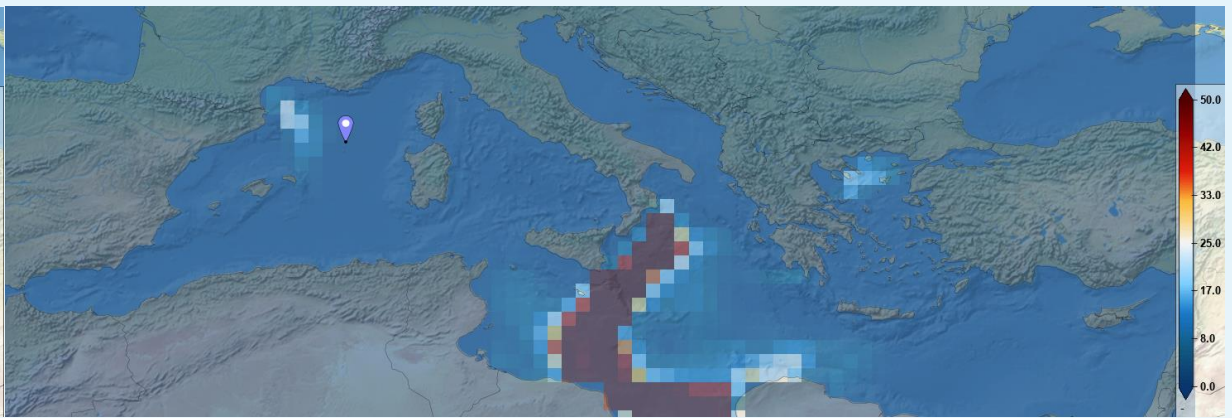
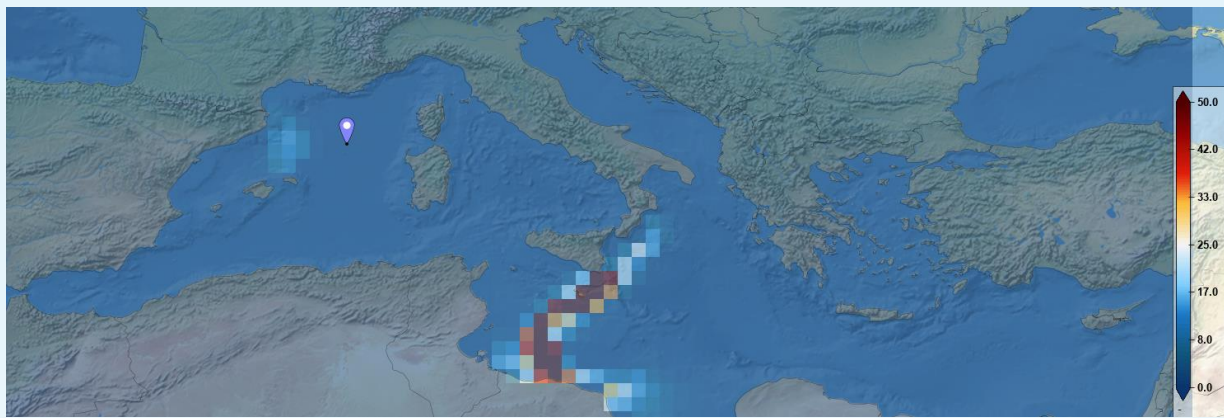
11 Jan 1987

14 Jan 1987

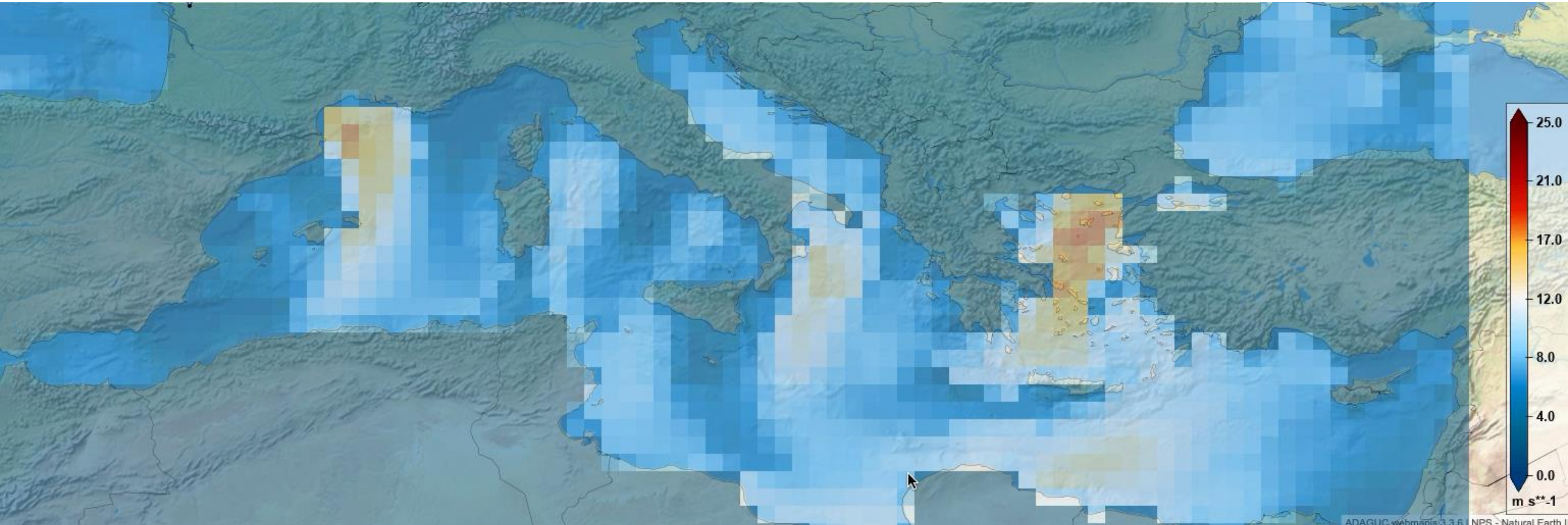


8 Dec 1988

9 Dec 1988



Storm (windspeed) on 8-9 Dec 1988



Activities 2021

- Extend SSI source data to 40 years
- Integrate with D4science infrastructuur
 - Implement methods to calculate SSI distribution maps and SSI scores (and other SSI statistics...)
 - Visualize SSI distribution maps (view services)
 - User interface for SSI



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Thank you

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