Primary Drivers o
Heatwaves in the N
Atlantic

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What are known dri

- Advection, heat flux, and intrinsic ocean modes are the primary drivers of sea su
- Different regions of the world show different primary drivers for anomalously w
- MHWs in the coastal oceans are primarily driven by abnormal movement of war
- For large seas like the Mediterranean, heat flux is dominant (Garrabou et al. 20
- Events in the open oceans tend to be driven by a combination of factors (Bond e

Why use a new method

The current standard is to analyse the drivers of one large MHW at a time.
MHWs are occurring too rapidly to spend a year understanding the drivers of an ind
Smaller events that would normally escape our notice may also be important.
Machine learning may be a better choice moving forwards.

Self-organi

Are there recurrent environmental patterns during MHWs?
If so, can these be detected/quantified/clustered by a computer?
Environmental data during MHWs are fed to the SOM to produce 12 most common s

Calculating MHWs and c

All of the SST pixels within each sub-region (Figure 1) were averaged together into o
MHWs were calculated from these averaged time series.
The start and end dates of each MHW were used to create a packet of synoptic infor

What do the res

Figure 3 shows the results from node 5 of the SOM.
In this node we see a strong warm nearshore Gulf Stream current.
The centre of the heat anomaly has a deeper mixed layer and negative downward he
The MHWs occurred predominantly in the Mid-Atlantic Bight (mab) region.
No overall seasonality, but more recent events occurring in spring and increasing in

Conclu

- The SOM technique functions better in the Northwest Atlantic if the Labrador Se
  - This is important to note as it supports the argument that this methodology
  - It is likely that this SOM technique will not work on scales larger than one me
- The nodes tell three main stories:
  - Warm GS + air pushing up from south along coast
  - Warm air sitting over entire coast
  - Warm air being pushed over the AO from the South/Southeast onto the coast
- A few nodes tell smaller stories:

The most intense MHWs occur during Autumn/Winter when air/sea patterns match those normally seen in Summer

Figures/MHWNWA_QR.png Figures/OFI_DAL_WHOI_logo.png

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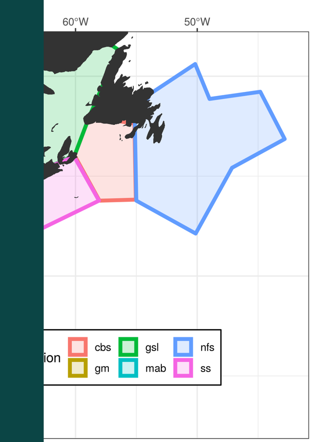
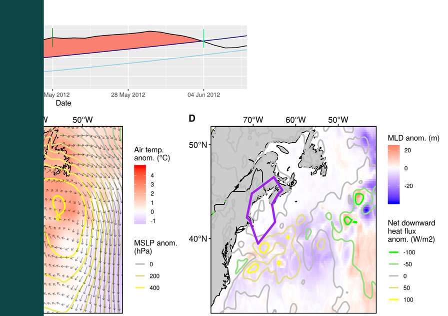
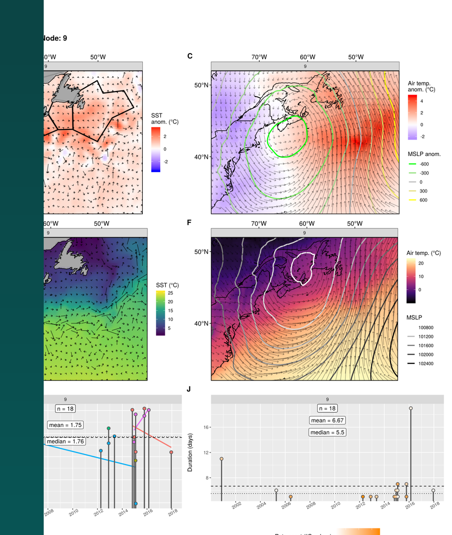


d on work by Richaud et al. (2016). The region abbreviations are: gm = Gulf of Maine, gls = Gulf of ic Bight, nfs = Newfoundland Shelf, ss = Scotian Shelf.



cus event is shown as purple polygon. A) The focal MHW shown in salmon; the start and end dates ST and surface current anomalies during the MHW. C) The wind stress, mean sea level pressure, and downward heat flux mixed layer depth anomalies.



lustered into this node were meaned to create the images in panels B - F. A) Regions and seasons of verlaid in black. C) Mean air temperature, MSLP, and surface wind anomalies. D) Mean mixed layer n Air temperature, MSLP, and surface winds. G) The cumulative intensity and season of occurrence in their cumulative intensity. H) The max intensity and region of occurrence for each MHW. Linear end in max intensity. I) The duration and rate of onset for each MHW.

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n the NE Pacific." *Geophysical Research Letters* 42 (9): 3414–20. https://doi.org/10.1002/2015GL063306.

view of Marine Science 2: 115–43. https://doi.org/10.1146/annurev-marine-120408-151453.

iterranean rocky benthic communities: effects of the 2003 heat wave." *Global Change Biology* 15 (5): 1090–1103. https://doi.org/10.1111

stern Tasmania: Trends, Interannual Variability, and Predictability." *Progress in Oceanography* 161. Elsevier: 116–30.

erature and Salinity Climatology Along the Continental Shelf Off the Canadian and Us East Coasts." *Continental Shelf Research* 124.

and Oceanic Patterns During Coastal Marine Heatwaves." *Frontiers in Marine Science* 4. Frontiers: 323.