Dense water plumes SW off Spitsbergen Archipelago (Arctic) in 2014-2017

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WSC = West Spitsbergen Current (Atlantic water)
BSW = Brine-Enriched Shelf Water
EGC = East Greenland current
Local processes: Cascading of dense plumes and their interaction with the Atlantic Water

Wobus et al., 2013: Regimes of the DW plumes

(a) arrested

(b) piercing

(c) shaving

Surface layer – warm and salty

800m

200m

1100m

200m

800m

Svalbard Science Conference Oslo 6 – 8 November 2017

Dense water plumes SW off Spitsbergen

Bensi et al.

Istituto Nazionale di Oceanografia e di Geofisica Sperimentale
Long-term variability of the Atlantic Water (low frequency mode with time scale of 50-80 yrs)

Figure 3. Long-term variability of temperature of the intermediate AW of the Arctic Ocean. Prolonged warm (red shade) and cold (blue shade) periods associated with phases of multi-decadal variability and a background warming trend are apparent from the record of 6-year running mean normalized AW temperature anomalies (dashed segments represent gaps in the record). Adapted from Polyakov et al. [2004].
Yearly variability of Atlantic and Deep waters from hydrographic surveys

Atlantic layer

Deep Layer (>800m)

IOPAN AREX cruises

Dense water plumes SW off Spitsbergen

Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

T.Pot

SAL

P.Dens

2013 2014 2015 2016 2017

2013 2014 2015 2016 2017

T.Pot

SAL

P.Dens
Time-series at the S1 mooring: 2014 - 2016

S1

- ADCP @ 920m
- CTD + trap @ 1020m
- RCM @ 1025m
- 1040 m DEPTH

Dense water plumes SW off Spitsbergen

Oslo – 8 November 2017
**Time-series at the ID2 mooring: 2014 - 2016**

T (and S) peaks occur simultaneously at the two stations, which are ~170km far away to each other.

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**Sea bottom 1040 m**

**CT @ 921 m**

**CT @ 1025 m**
Time-series at the S1 mooring: 2014 - 2016

S1

- ADCP @ 920m
- CTD + Sed.trap @ 1020m
- RCM @ 1025m
- 1040 m DEPTH

Forhman et al. (1998)

Dense water plumes SW off Spitsbergen
Time-series of bottom currents at S1 mooring: 2014 - 2017

Prevalent current rotations observed at S1 are clockwise (anticyclonic).

Dense water plumes SW off Spitsbergen

Oslo 6 – 8 November 2017
Air-ocean interaction: the wind effect on the deep currents (experimental datatates)

CCT ‘Dirigibile Italia’
Italian-CNR Climate Change
Tower In Ny-Ålesund
Air-ocean interaction: the wind effect on the deep currents (ECMWF datasets)

ECMWF data confirm the synopticity of the wind speed over the west Spitsbergen Shelf.

Larger wind peaks occur during winter and their variability are consistent with those of the moorings.
1. Deep moorings at different locations along the west Spitsbergen slope have been fundamental to detect turbidity plumes triggered by meteorological perturbations.

2. Air-sea interactions likely could have been predominant in the last years when a general warming and ice reduction of the Arctic could have negatively influenced the production of dense water through the brine rejection phenomena.
Dense water plumes SW off Spitsbergen Archipelago (Arctic) in 2014-2017

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