

Structure and variability of the Norwegian Atlantic Current and associated eddy field from surface drifters

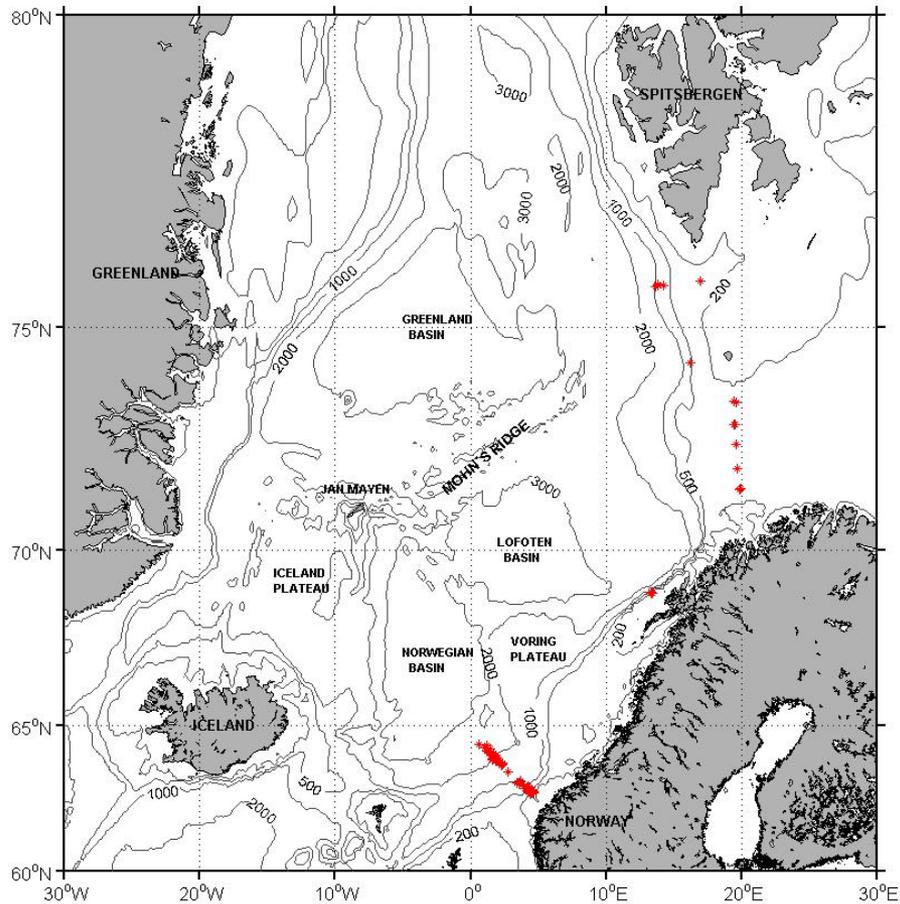
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Outline

- **POLEWARD deployments of SVP drifters and historical data**
- **Eulerian maps**
 - Mean velocity field
 - Eddy kinetic energy
- **Seasonality**
 - Mean velocity field
 - Eddy kinetic energy
 - Principal axes of variance
- **Lagrangian Time and Spacescales and Diffusivity in domains**

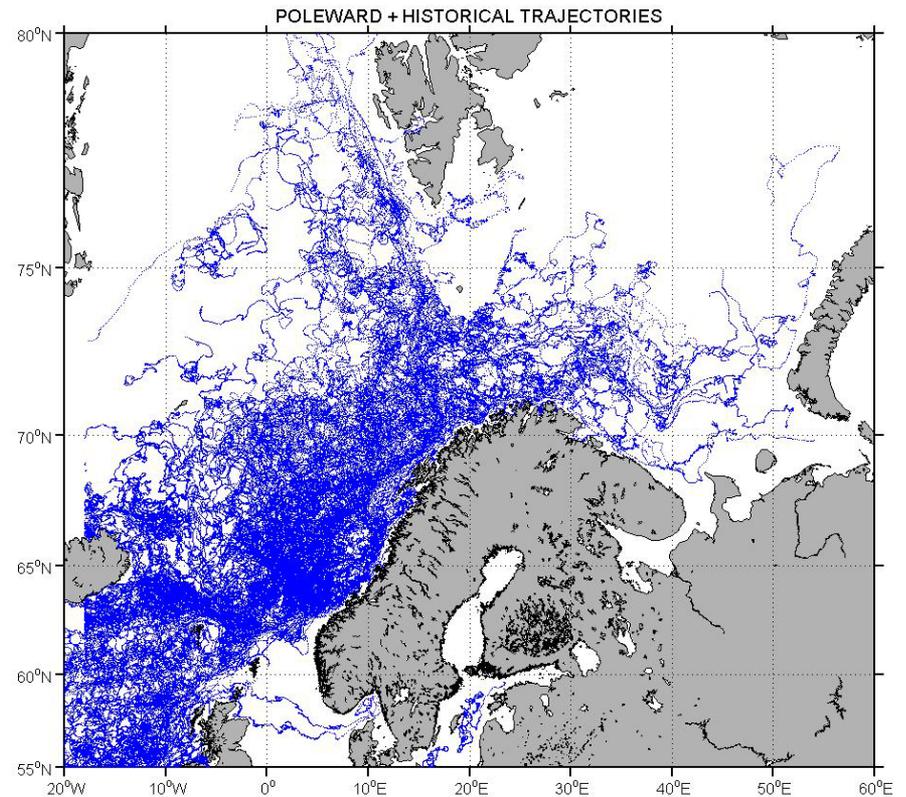
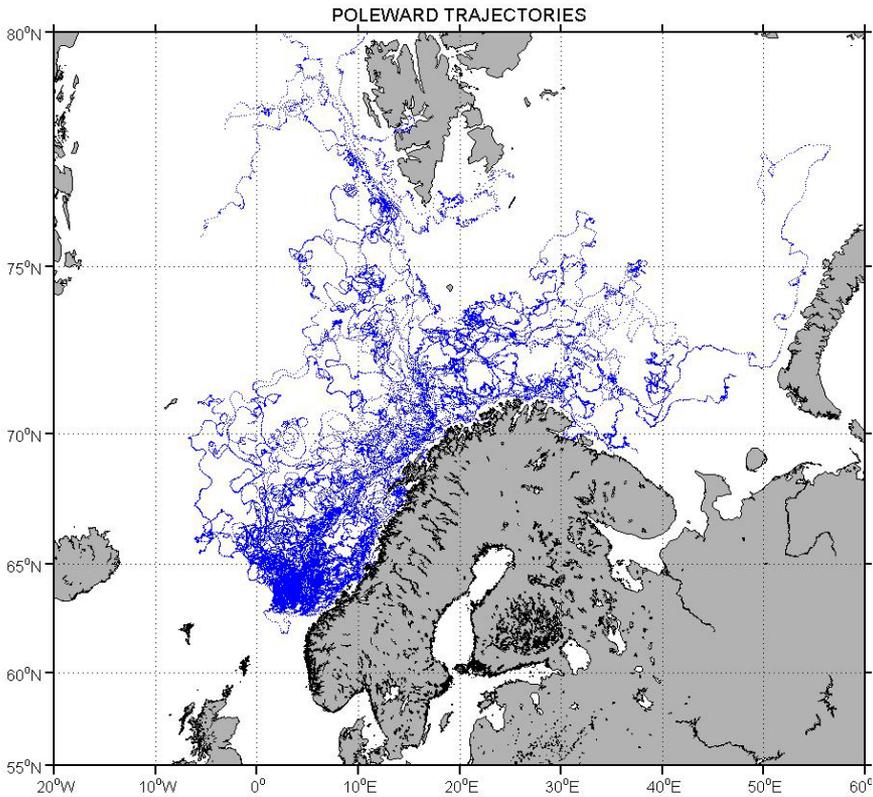
Deployments by POLEWARD



- Six field campaigns through June 2007 to October 2008
- 118 surface drifters
- Available through the Global Drifter Program database

POLEWARD & Historical Data

1990-2008, 363 drifters, more than 63,000 buoy days

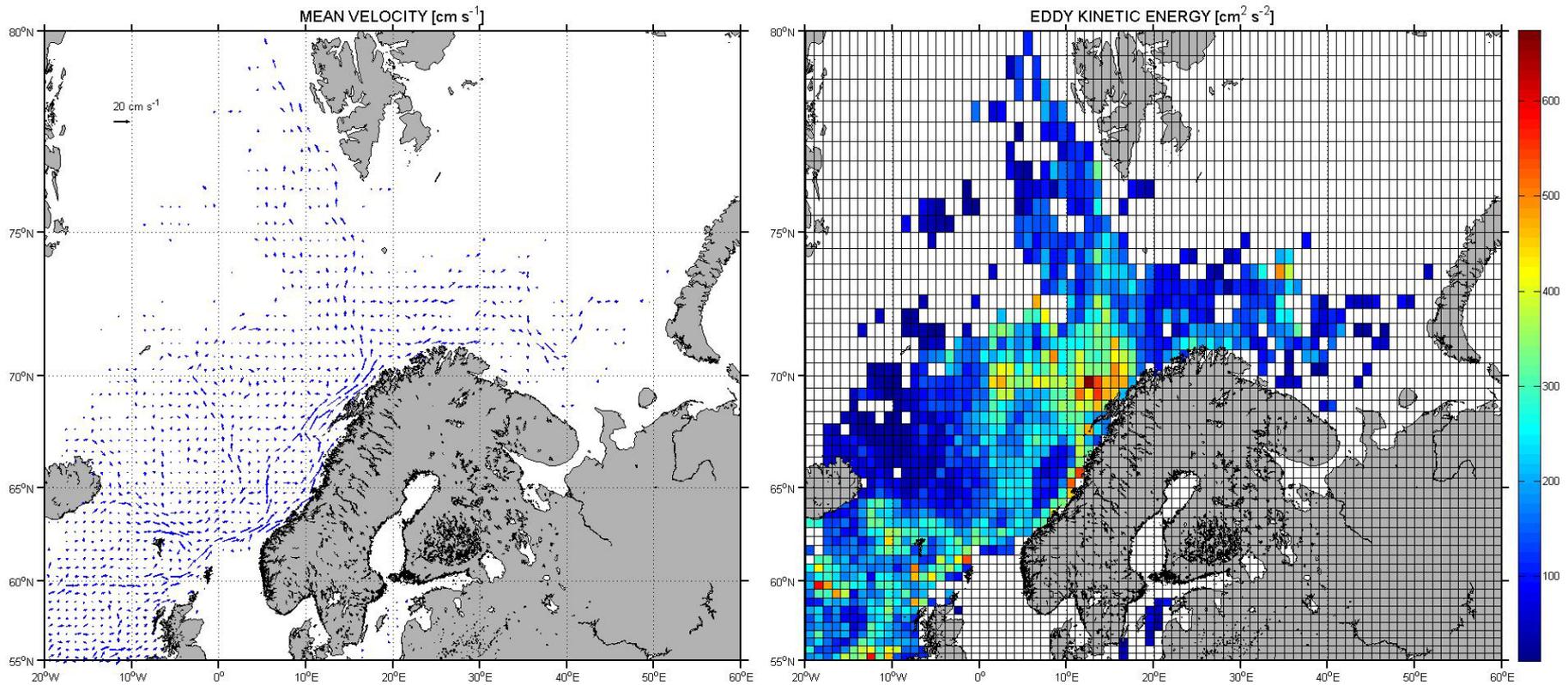


Data processing

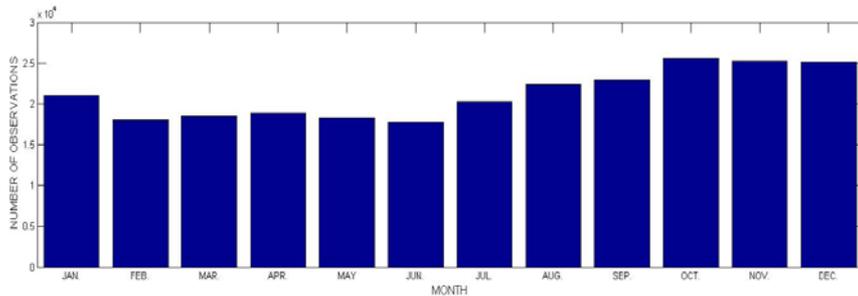
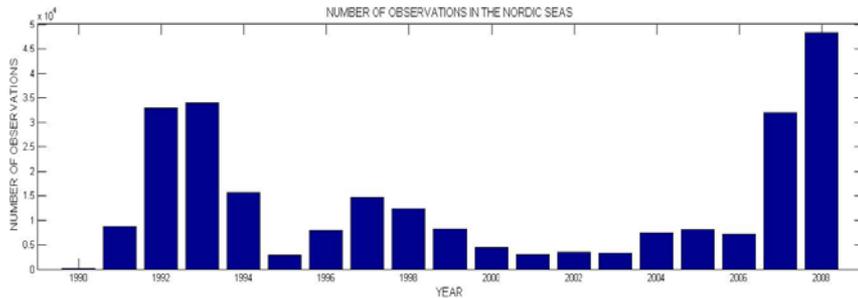
- Quality controlled
- Interpolated to uniform six-hourly intervals
- Data with gaps greater than 1 day are treated as separate drifters
- Low-pass filtered with cutoff period at 25 hours

Mean Velocity Field [cm s^{-1}] and Eddy Kinetic Energy [$\text{cm}^2 \text{s}^{-2}$]

Bin Size: 1° Longitude x 0.5° Latitude



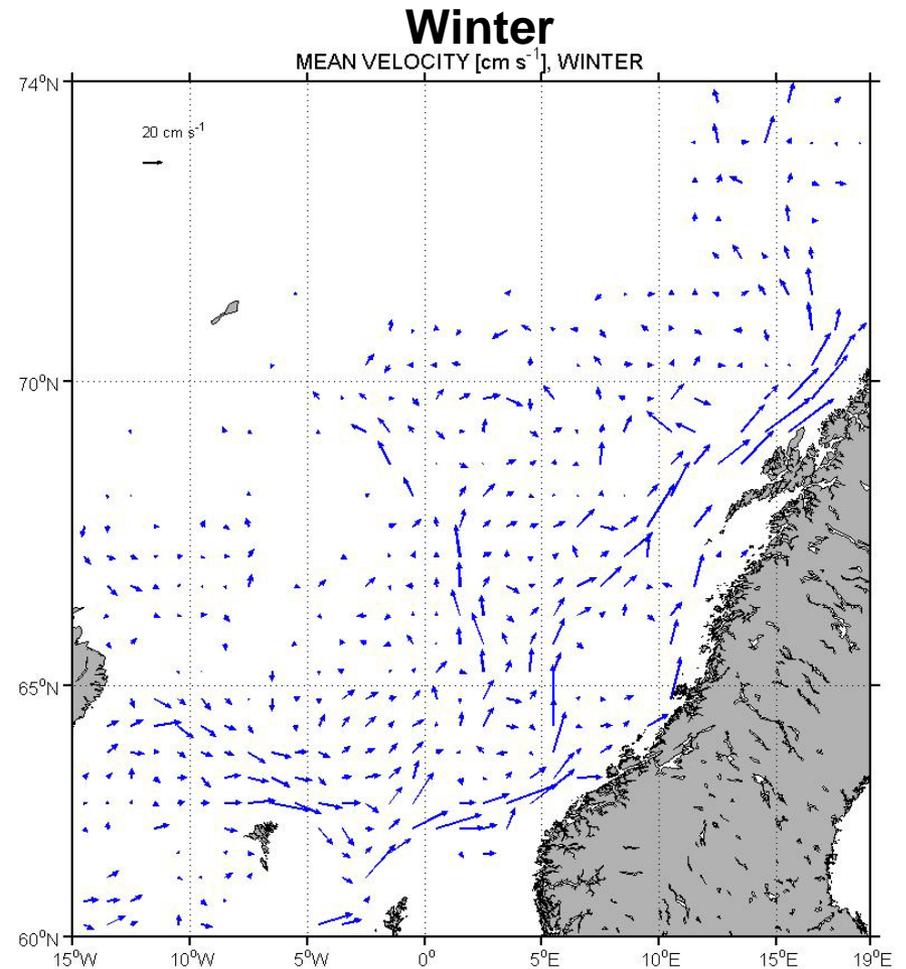
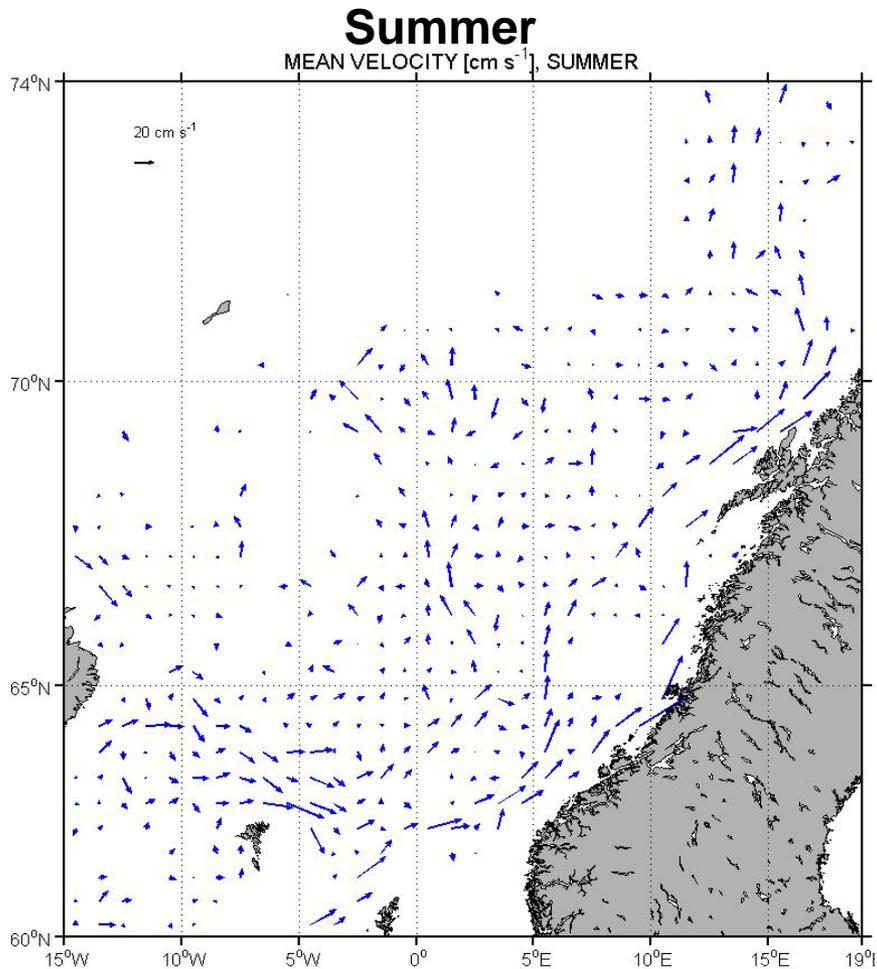
Seasonality



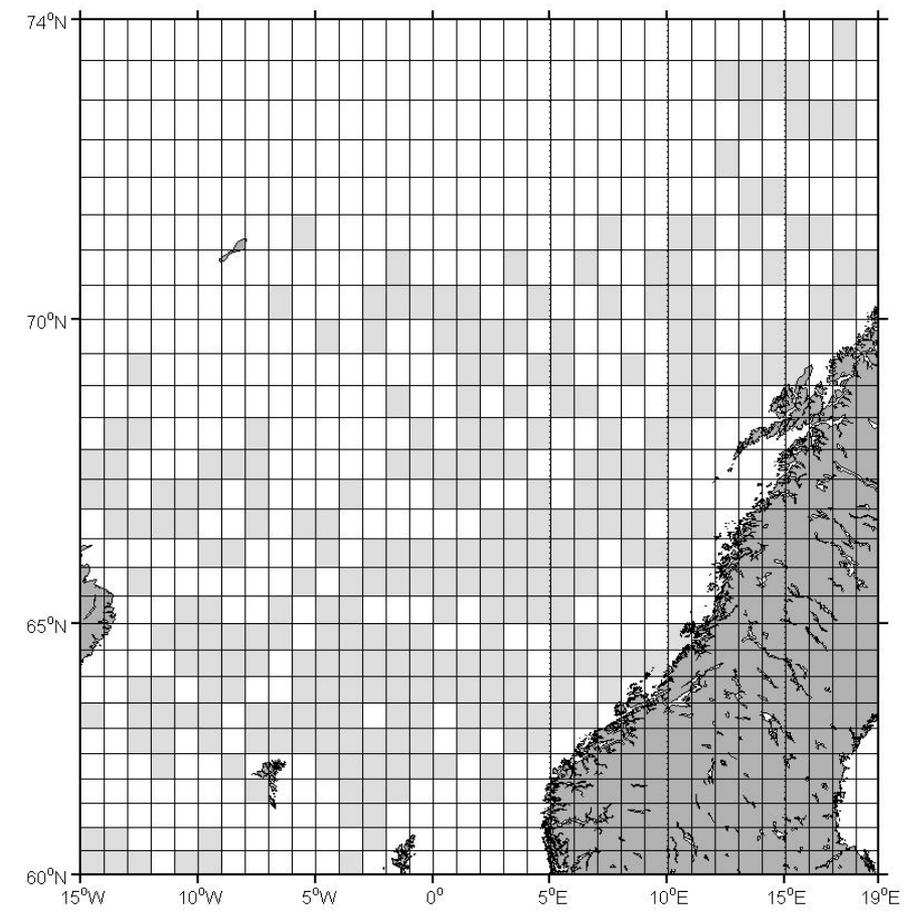
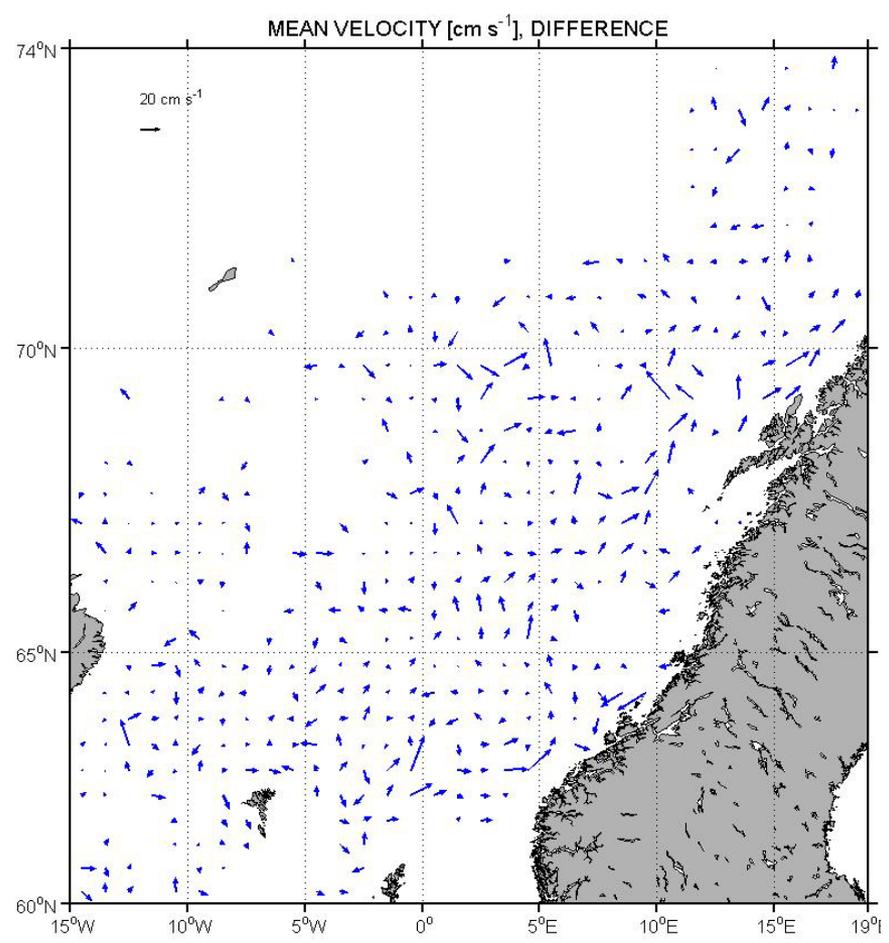
- Summer
 - May to October (50.1 % of the data set)
- Winter
 - November to April (49.9 % of the data set)
- The data set is suited to study seasonal variability in the Nordic Seas

Mean Velocity Field [cm s^{-1}]

Bin Size: 1° Longitude x 0.5° Latitude

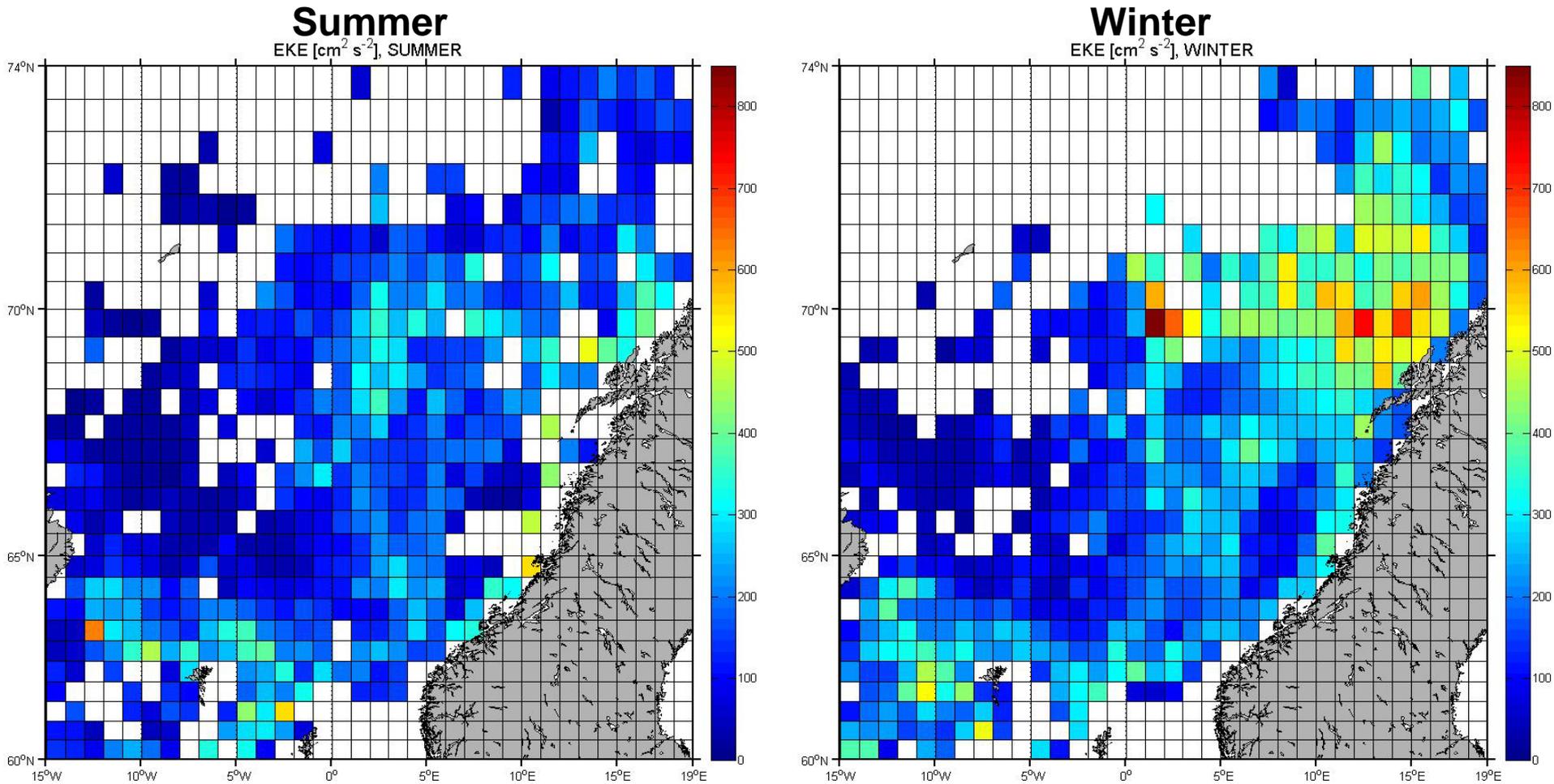


Difference between the mean velocity field for summer and winter seasons



Eddy Kinetic Energy [$\text{cm}^{-2} \text{s}^{-2}$]

Bin Size: 1° Longitude x 0.5° Latitude

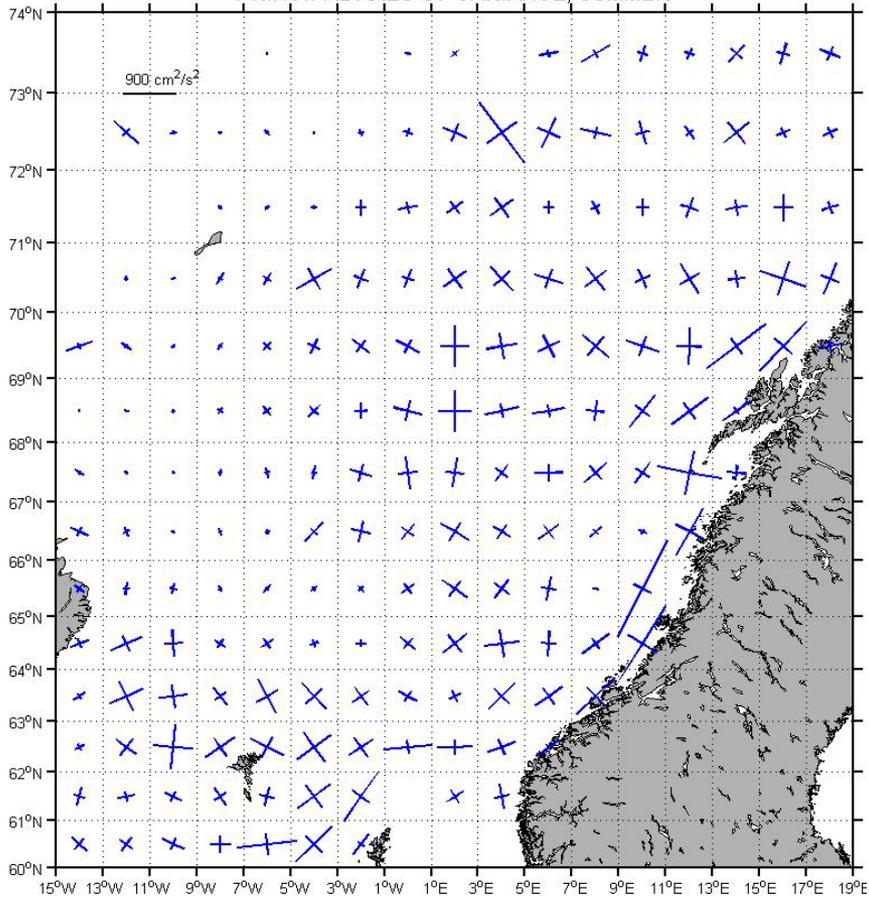


Principal Axes of Variance [$\text{cm}^2 \text{s}^{-2}$]

Bin Size: 2° Longitude x 1° Latitude

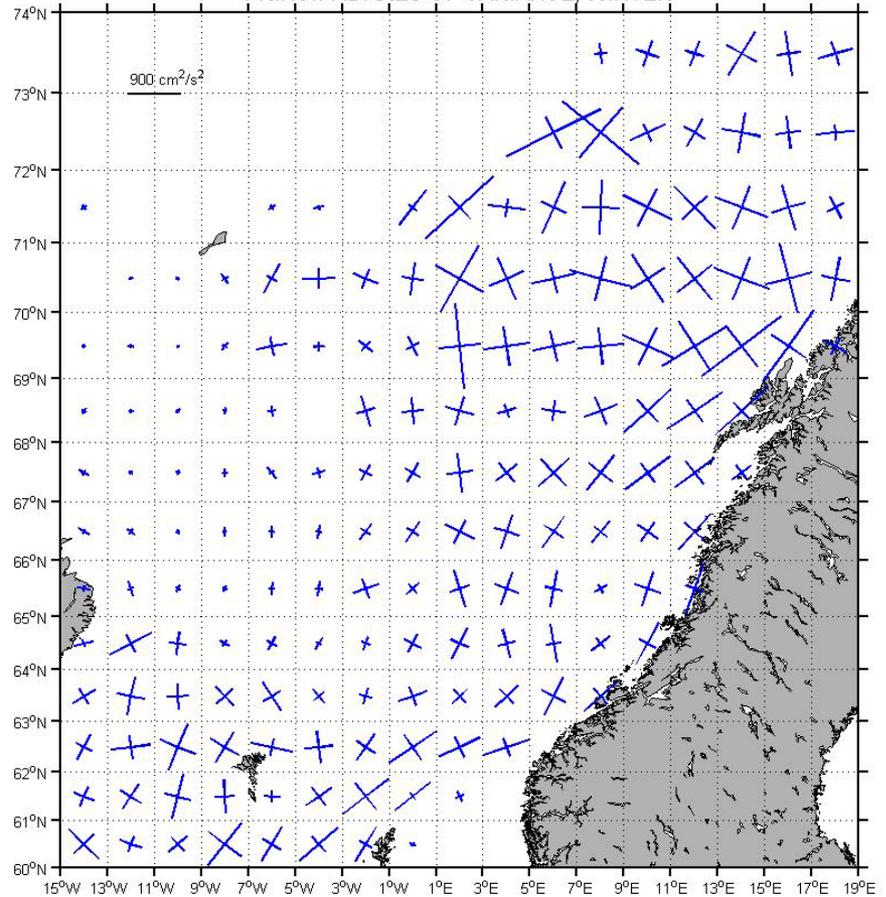
Summer

PRINCIPAL AXES OF VARIANCE, SUMMER

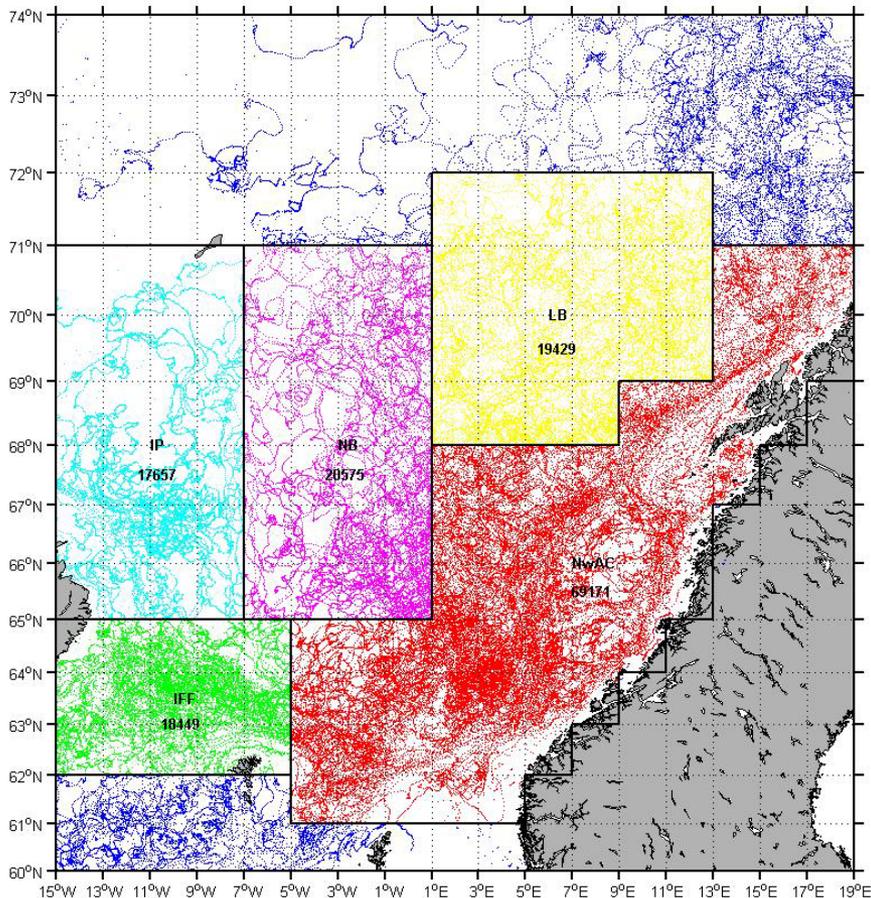


Winter

PRINCIPAL AXES OF VARIANCE, WINTER

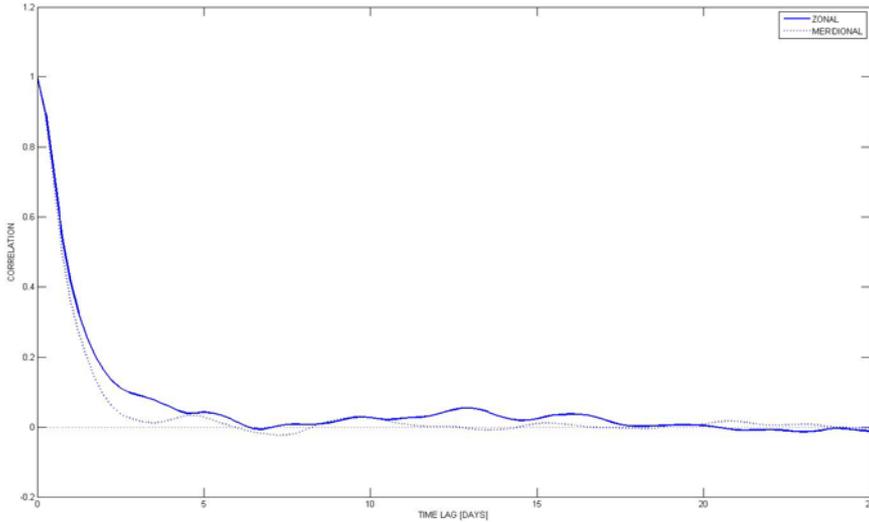


Lagrangian Time- and Spacescales and Diffusivity in domains



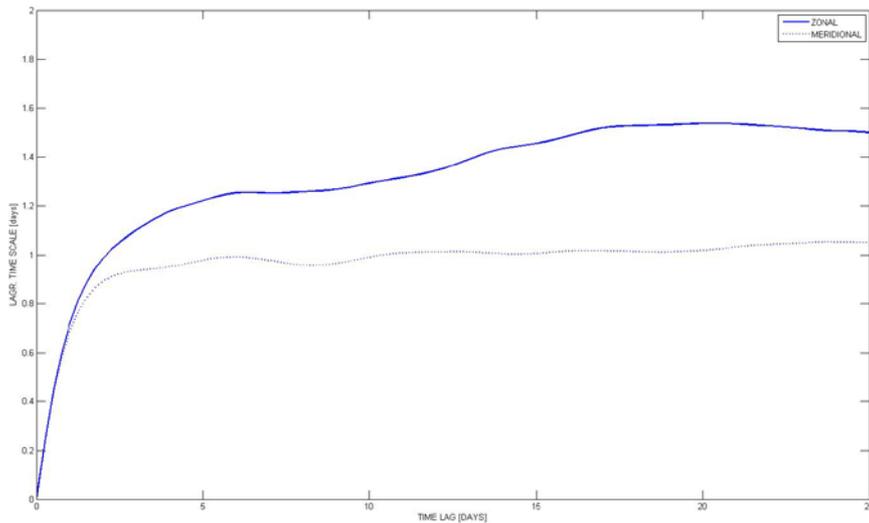
- Five domains corresponding to different velocity statistical regimes have been selected
 - Iceland Faroe Front
 - Iceland Plateau
 - Norwegian Basin
 - Lofoten Basin
 - Norwegian Atlantic Current

Lagrangian Time- and Spacescales and Diffusivity



$$T_L = \int_0^{\infty} R \, d\tau$$

$$L_L = u' T_L$$



$$\kappa = u' L_L$$

Lagrangian Time- and Spacescales and Diffusivity in domains

Table 1. Lagrangian Statistics integrated to 20 days.

Region	Number of Obs.	$\langle u_{11}^2 \rangle$, $\text{cm}^2 \text{s}^{-2}$	$\langle u_{22}^2 \rangle$, $\text{cm}^2 \text{s}^{-2}$	$10^7 \kappa_{11}$, $\text{cm}^2 \text{s}^{-1}$	$10^7 \kappa_{22}$, $\text{cm}^2 \text{s}^{-1}$	L_{11} , km	L_{22} , km	T_{11} , days	T_{22} , days
IFF	18,449	200.8	197.4	2.47	1.77	16.6	12.2	1.3	1.0
IP	17,657	43.0	46.4	1.12	2.20	13.3	20.6	1.8	2.2
NB	20,575	119.2	127.5	1.19	2.39	10.1	19.4	1.0	1.8
LB	19,429	283.4	276.1	4.62	2.74	25.8	16.4	1.7	1.1
NwAC	69,171	210.3	217.4	2.70	2.58	17.8	16.7	1.4	1.2

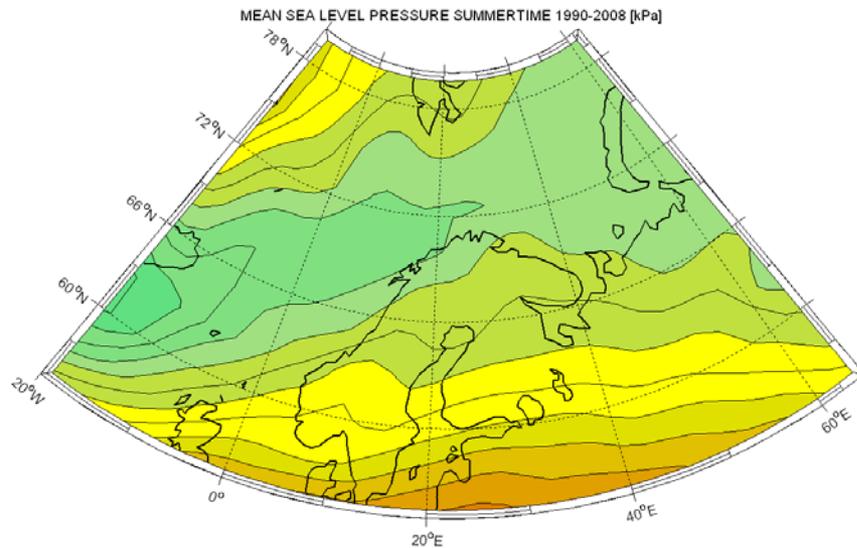
- The IP has minimum velocity variances, less than $50 \text{ cm}^2 \text{s}^{-2}$, and minimum diffusivity
- The LB has maximum velocity variances, about $280 \text{ cm}^2 \text{s}^{-2}$, and maximum diffusivity
- Maximum length scales are found in the LB and the NB has the smallest
- The Lagrangian Time scales vary from 1.0 Day in the IFF and NB to 2.2 Days on the IP

Summary

- The mean velocity field reveals the eastern and the western branch of the NwAC and also the NCC, stronger in the wintertime.
- The EKE exhibits stronger variability in the Lofoten Basin area, particularly in the wintertime.
- The variance axes show significant variations, both spatially and seasonally.

SLP for summer and winter seasons. Data from NCEP/NCAR

Summer



Winter

