**Energetics of mixing in a stratified basin without tides**

**Processes**
- **BaTRE**
- Combined approach of:
  - long time measurements (Temperature, Salinity, Currents)
  - tracer release (~SF$_5$CF$_3$)
  - microstructure measurements (MSS-90)

**Hydrography**
- CTD cast 2 weeks after the tracer release
- Inflow just before the tracer release

**Budget Methods**
- Tracer Analysis
  - SF$_5$CF$_3$ Tracer Injection
  - First sole injection of SF$_5$CF$_3$

**Available Energy**
- Near inertial wave energy flux
  - Phase shift
  - Energy flux calculation via the phase velocity

**Vertical Energy Flux of Internal Waves**
- Eigenvectors of the 1st EOF mode (inertial)
  - 1st mode of EOF explains 73% of the sub inertial motions
- Sub inertial motions
  - primarily inertial/near inertial internal waves
  - 3 day period are coherent and counter clockwise
  - excludes Baltic Sea eddies (Beddies)
  - possibly Topographic waves (period fits ~ 72 hours) but the velocity should show two counter clockwise rotating gyres, the role of stratification is unclear
- Ideas about the nature of motions
  - coherence of motions larger than the internal Rossby radius ~ 5 km
  - excludes Kelvin waves (diameter of GB >> 5 km)
  - excludes Baltic Sea eddies (Beddies)

**Empirical Orthogonal Functions**
- Eigenvectors of the 1st EOF mode (sub inertial)
  - 1st mode of EOF explains 73% of the sub inertial motions

**Tracer Analysis**
- **Rotary spectrum**
  - Inertial ($T < 1$ day)
  - sub inertial ($15$ days $> T > 1$ day)
  - counter clockwise

**Available Energy**
- **Near inertial wave energy flux**
  - Measurable phase shift
  - Near inertial internal waves ($T > 1$ day)
  - well known, broadband peak around the inertial frequency
  - alignment of energy frequency via function $G$ (Eq. (36)) and the well known phase shift
  - Energy is expressed via the dissipation rate ($\epsilon = G E_{\Delta f}$) (Eq. (7)), this can be compared with the budget methods and the microstructure measurements
  - $F_c = c E_{\Delta f}$ (Eq. (5))

**Motivation/Baltic Tracer Release Experiment**
- Gotland Basin (GB)
  - Largest basin in the Baltic
- Natural laboratory to study
  - wind induced mixing (no tides)
  - barotropic contribution to mixing
  - boundary/interior mixing
- **BaTRE**
  - largest basin in the Baltic
  - wind induced mixing (no tides)
  - barotropic contribution to mixing
  - largest Basin in the Baltic
  - near inertial wave contribution to mixing

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**Seasonality of mixing**
- Seasonality of momentum input through wind
- Same seasonality in the kinetic energy within the basin
- Diffusivity (Eq. (1), (2)) changes one order of magnitude between mixing periods, storms events are resolved
- Volume averaged dissipation rates (Eq. (3), (4)) are in the order of 10^{-6} W kg^{-1}, the noise level of the microstructure probe, pointing to boundary mixing, where higher dissipations were measured

**Effects of mixing: Buoyancy change of buoyancy over time**
-瑞季性变化的改变
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  - near inertial wave contribution to mixing
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