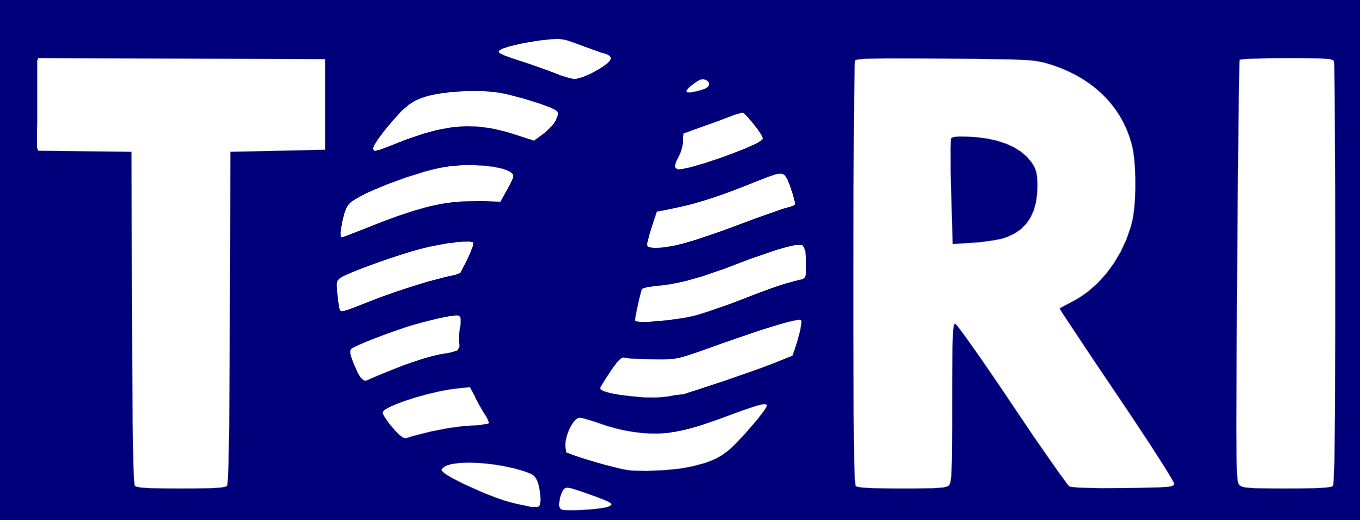# Analyses of surface currents around Taiwan derived from the TORI HF-Radar Observations

Hendrik Grosselindemann, Shao-Hua Chen, Xin-Ni Lin, Chia-Yan Cheng, Chau-Chang Wang

TORI   **GEOMAR**

1 Introduction & Motivation

- Different dynamics around the island
- Kuroshio Current in the East
- Seasonal varying Monsoon winds
- Strong tidal dynamics

-> Is CODAR surface current data showing these signals and/or something new?
-> What is the relative influence of wind and geostrophic flow on different spatial and temporal scales?
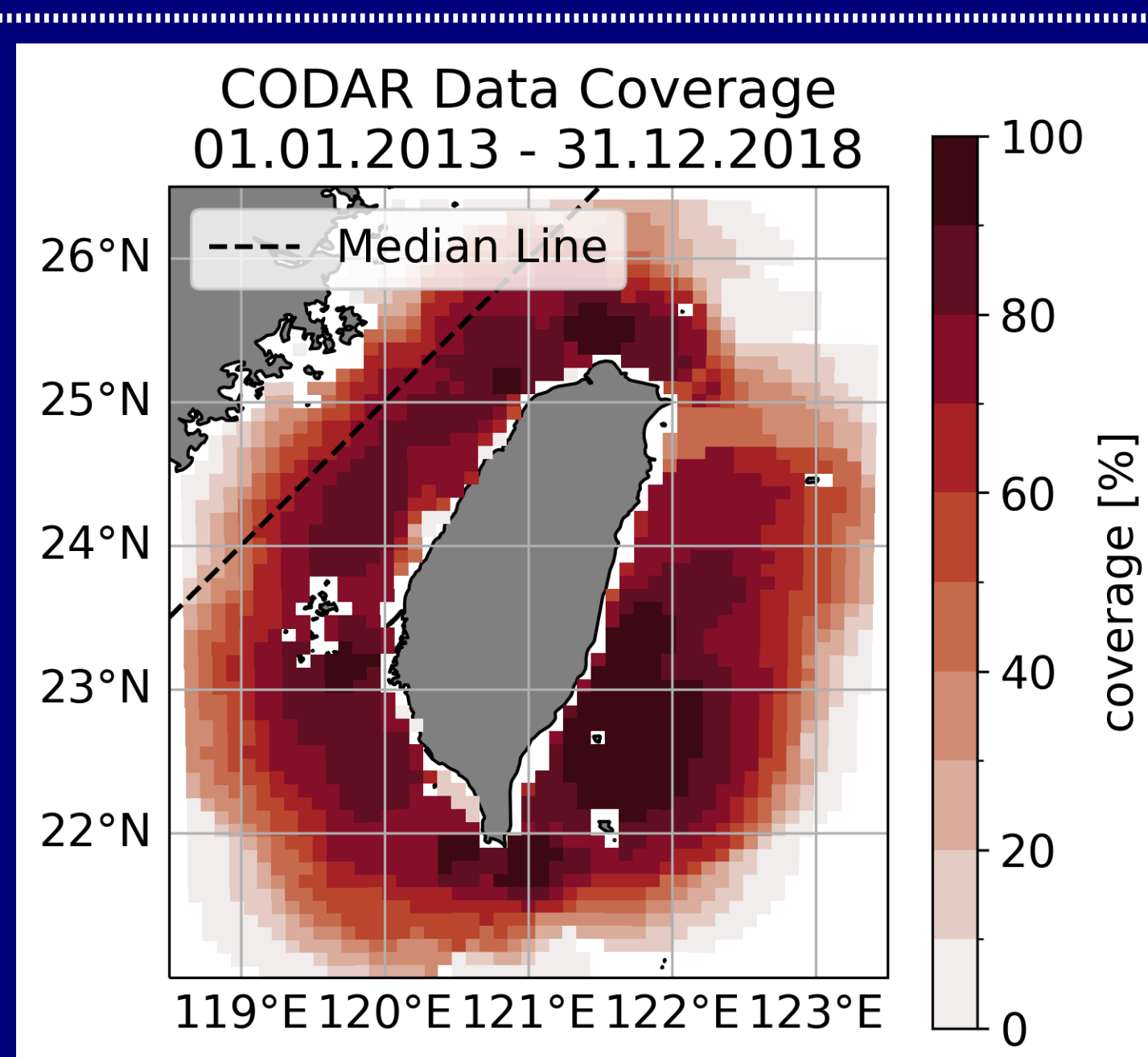
2 Data & Methods

- Hourly CODAR surface currents from TORI
- Hourly wind data from ERA5 Reanalysis
- Daily geostrophic currents from CMEMS
- all from 01.01.2013 - 31.12.2017

- Non-uniform FFT
- Tide Removal
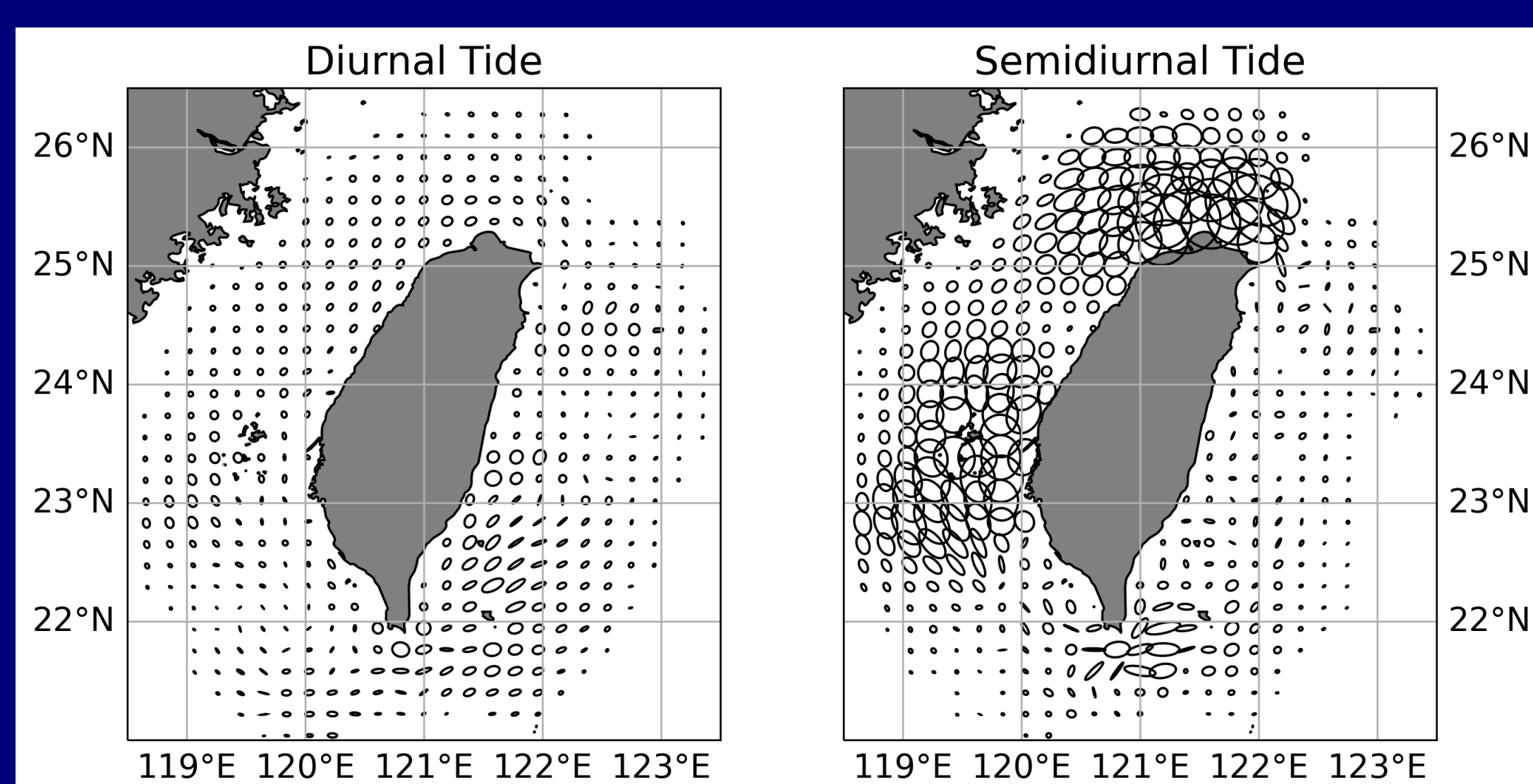- EOF Analysis
- Vector cross-correlation

3 Results

3.1 Coverage
- good around the whole island
- best in Southeast
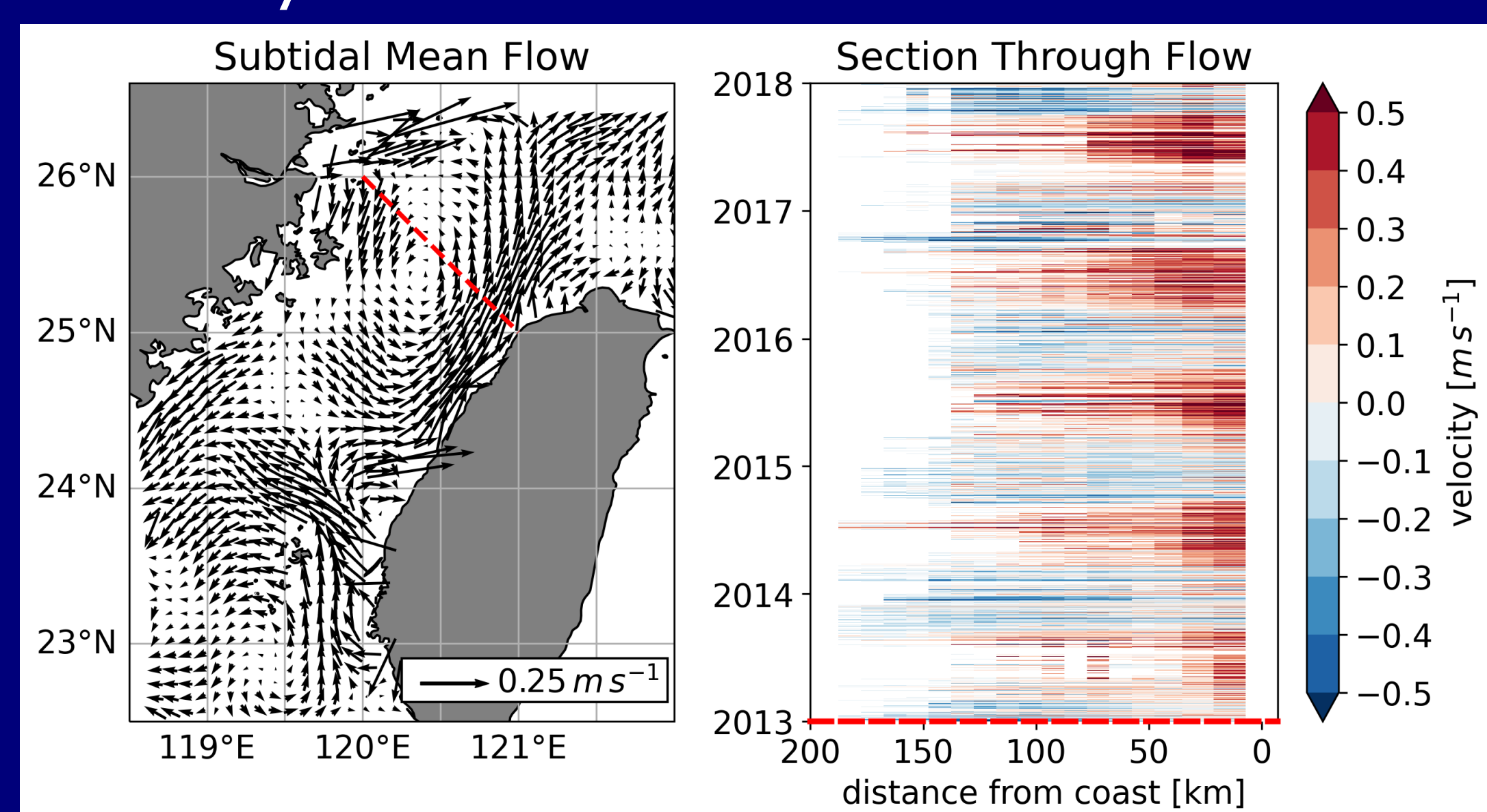- mostly sufficient to perform trustworthy analysis
- important to keep in mind

CODAR Data Coverage 01.01.2013 - 31.12.2018

3.4 EOF Analysis
- pattern of northward/ southward flow
- seasonal cycle

EOF First Mode. Expl. Variance: 44.7%
Principle Component Time Series

3.2 Tides
- semidiurnal dominates; especially in the Strait
- diurnal important in the east
- fits to Jan et al. 2004

Diurnal Tide   Semidiurnal Tide

3.5 Vector Cross-Correlation
- Wind influence larger in Taiwan Strait
- Geostrophy dominates the east
- Wind Veering angle in Taiwan Strait could relate to Ekman dynamics
- Flow is on average in similar direction as geostrophy

CODAR Windstress   CODAR Geostrophy

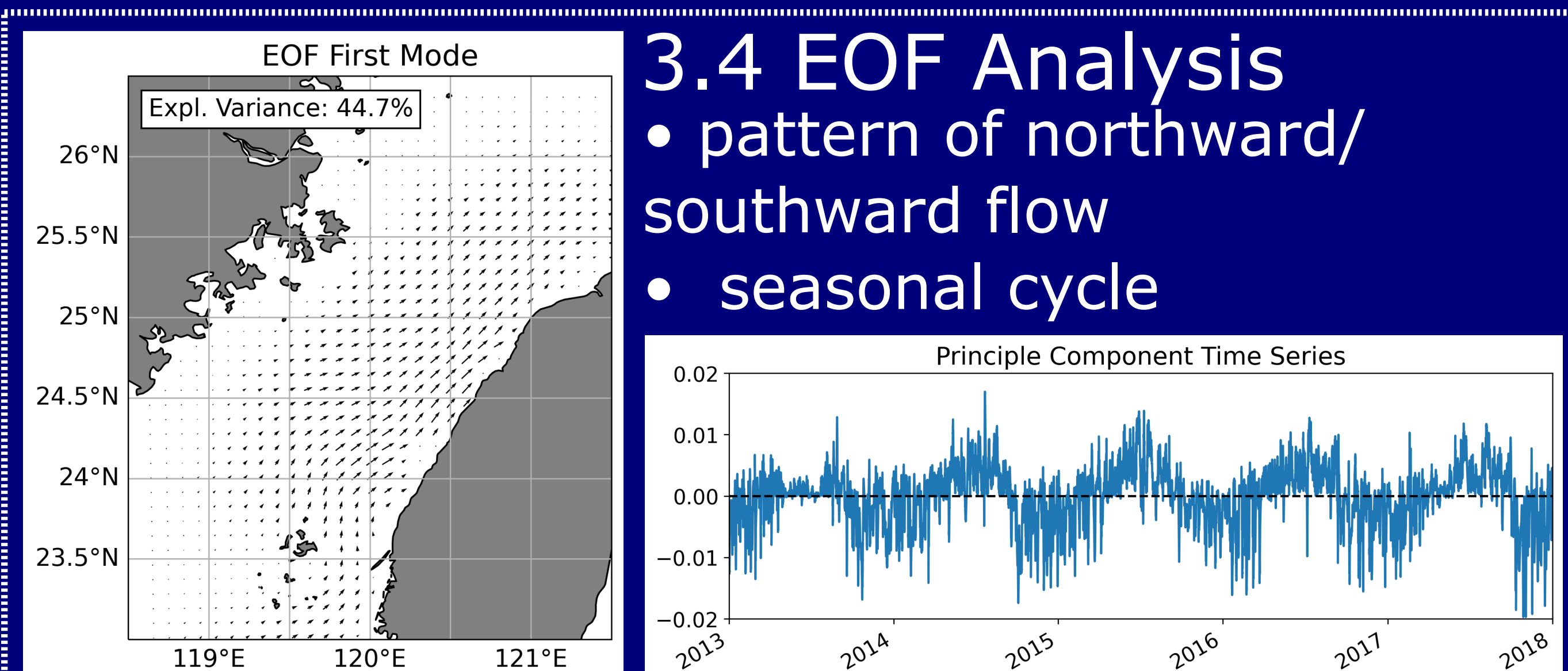### 3.3 Subtidal Flow
- northward mean flow along the west coast
- mean flow is guided by bathymetry
- seasonal cycle of northward and southward flow

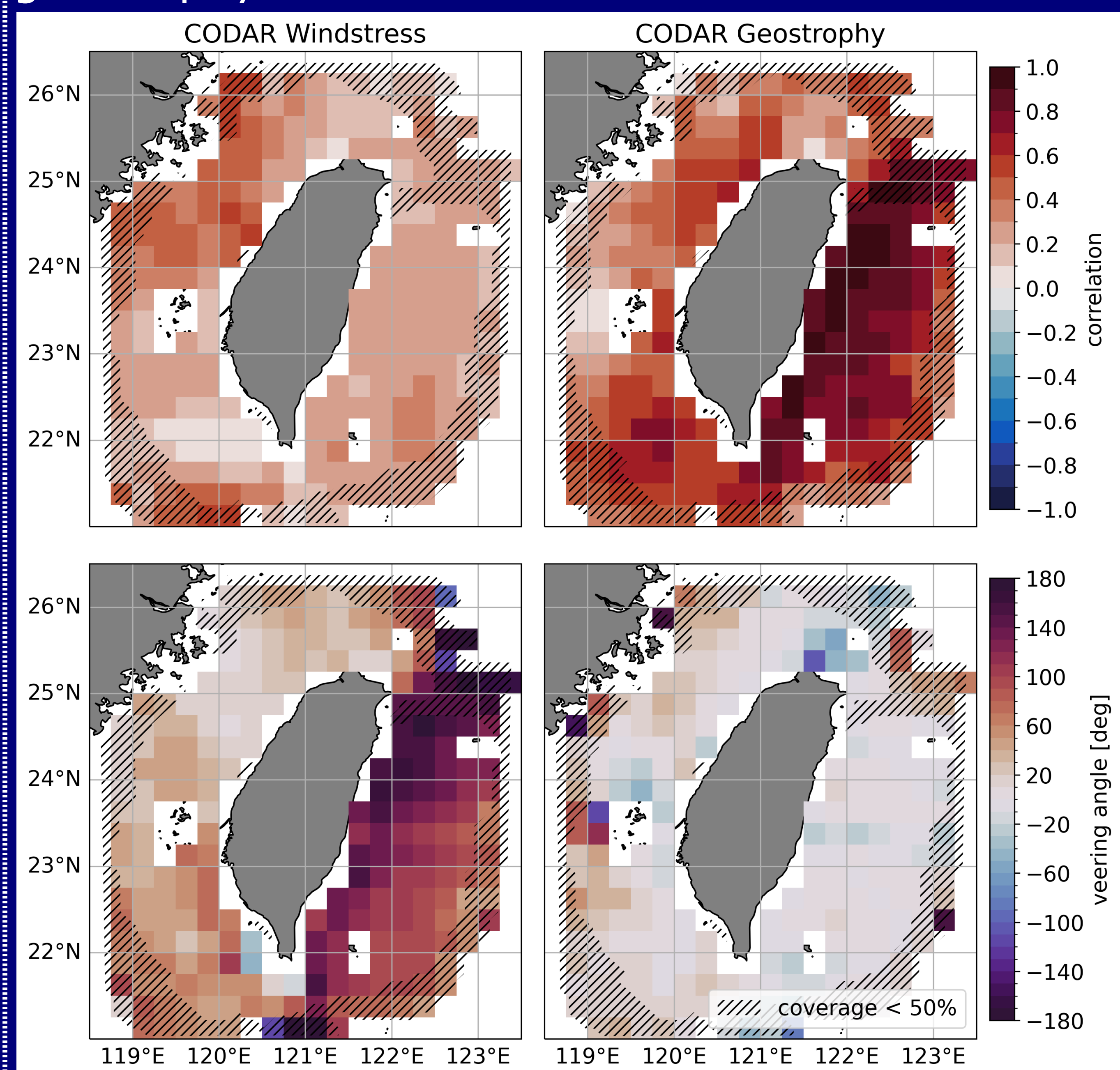Subtidal Mean Flow   Section Through Flow

4 Conclusion

- TORI HF-Radar observations provide a great dataset to study ocean dynamics around Taiwan
- Tides are very prominent in the raw data
- Subtidal flow shows seasonal fluctuation in Taiwan Strait
- Radar-derived subtidal flow is largely related to satellite-derived geostrophic flow
- Wind acts on seasonal timescales to influence the surface signal
- Are results statistically significant?
- Apply an eddy tracking algorithm to possibly investigate their interaction with the Kuroshio