A Review of Lagrangian Time Series Models for Ocean Surface Drifter Trajectories (Sykulski et al. (2016)

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Abstract

Put your project summary here.

1 Introduction

1.1 Application

1.2 Data Description

Figure 1 included here

1.3 Oceanography background

- inertial oscillations
- turbulent background

1.4 Spectral analyses of time series

- wave equations
- Euler's formula
- Fourier transformation
- periodogram
- relationship between autocovariance and power spectral density
- complex-valued velocities

- include Figure 2

2 Methods

2.1 Model

2.1.1 Inertial oscillations

- Ornstein-Uhlenbeck process
- frequency as a free parameter
- include figure 3

2.1.2 Turbulent background

- Matérn model
- comparison to other integer order processes (e.g. fractional brownian motion)

2.1.3 Aggregate model

State that you can add two component models together

2.2 Model fitting

2.2.1 Whittle likelihood

- explanation of original Whittle likelihood and its problems (aliasing, leakage)
- description of tapering 'solution' to Whittle and discussion of its imperfections
- blurred whittle likelihood
- allows for uncertainty estimates via asymptotics (Fisher information)

2.2.2 Model misspecification

- semi-parametric approach in both time and frequency

2.2.3 Time-varying parameters for non-stationarity

2.2.4 Model selection/likelihood ratio tests

3 Results

3.1 Simulated results

Include Figure 5

3.2 Real drifter data (with time-varying parameters)

Include Figures 6-10

4 Discussion

- powerful technique overall
- more work needed on selecting windows

5 Appendix

5.1 Errata

- Typo in equation 13

5.2 Optimization technique

- My approach transforming parameters to an unconstrained space gives slightly better (higher maximum likelihood) estimates than their use of Matlab's built-in box constraint approach