



Practice with HF radar data

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IR0000032 – ITINERIS, Italian Integrated Environmental Research Infrastructures System
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Mission 4 “Education and Research” - Component 2: “From research to business” - Investment
3.1: “Fund for the realisation of an integrated system of research and innovation infrastructures”



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Dataset Open

Current velocities measured by HF radars in Gulf of Trieste - April 2012

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CODAR SeaSonde HF-radar derived surface ocean velocity in the Gulf of Trieste during the TOSCA experiment - April 2012

TOSCA - Tracking Oil Spill and Coastal Awareness, <http://www.tosca-med.eu>

Sensors (CODAR SeaSonde HF Radars) property and data retrieval --> CNR-ISMAR, La Spezia;

Sensors installation and operation --> OGS

Notes

This dataset was produced thanks to the Tracking Oil Spills and Coastal Awareness (TOSCA) Network project [grant number 2G-MED09-425], co-financed by the European Regional Development Fund in the framework of the MED programme

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Versions

Version v1 Jun 13, 2019
10.5281/zenodo.3245409

Cite all versions? You can cite all versions by using the DOI [10.5281/zenodo.3245408](https://doi.org/10.5281/zenodo.3245408). This DOI represents all versions, and will always resolve to the latest one. [Read more.](#)

External resources

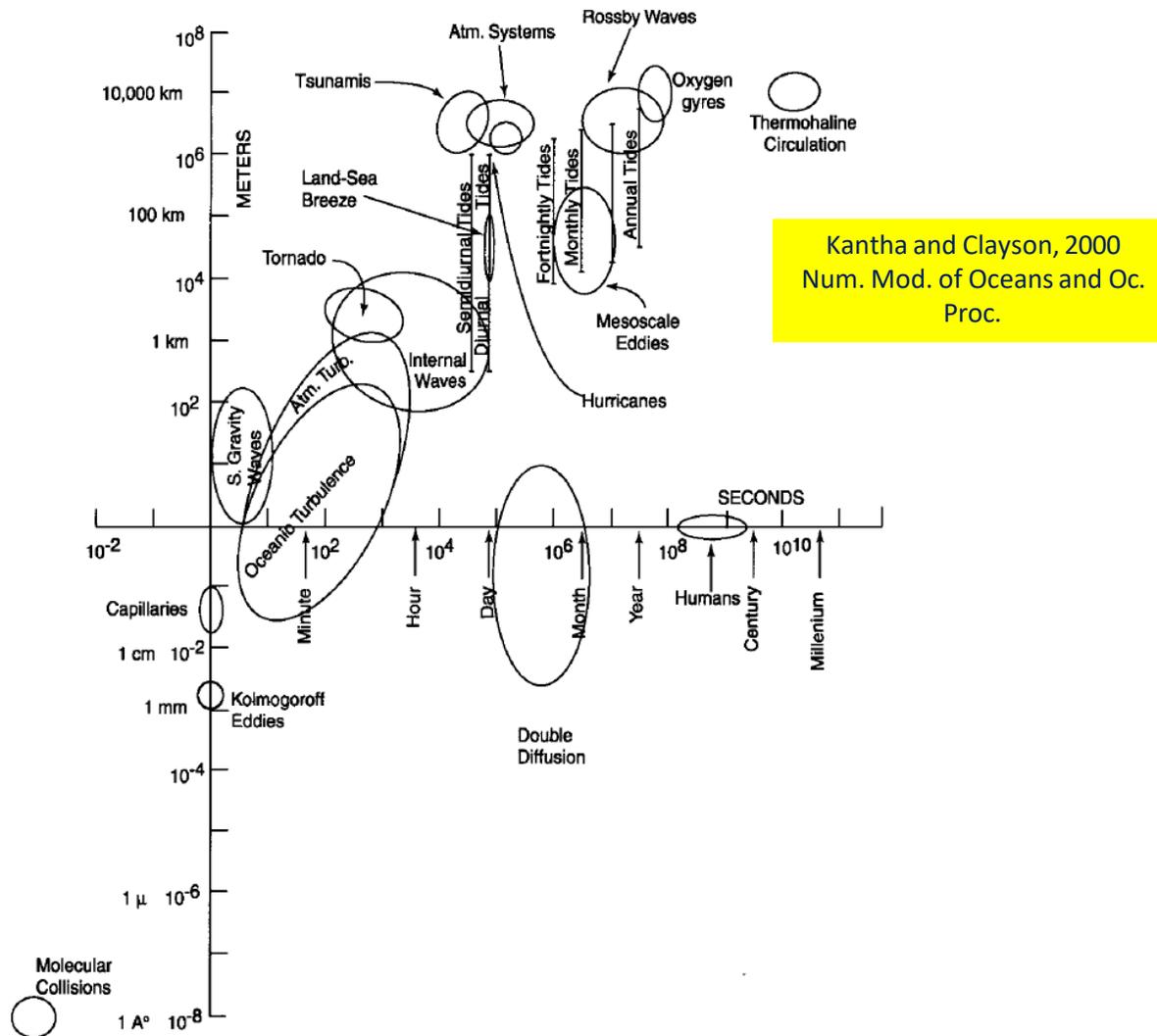
Indexed in

Enrile et al, 2019
PLOS One

Enrile et al, 2018
Cont. Shelf Res.

Now check the <https://www.hfrnode.eu>

Scale separation



- Ocean circulation at different scales must be known for dispersion purposes
- Scale range is very broad and varies from planetary waves to molecular motion
- Hypothesis: separation of scales between the resolved scales of interest (resolved velocity u) and the unresolved “turbulent” ones (“turbulent” velocity u')
- Very difficult to apply because such a separation is not clear and distinct: continuum spectrum of motions

Autoregressive models and “random walk”

An autoregressive (AR) model is a representation of a type of random process and may describe certain time-varying processes in nature. The autoregressive model specifies that the output variable (e.g. ocean velocity field) depends linearly on its own previous values.

Generally speaking, an auto-regressive model of order p is usually indicated with $AR(p)$ and defines the “turbulent” velocity \mathbf{u}' at the timestep n as:

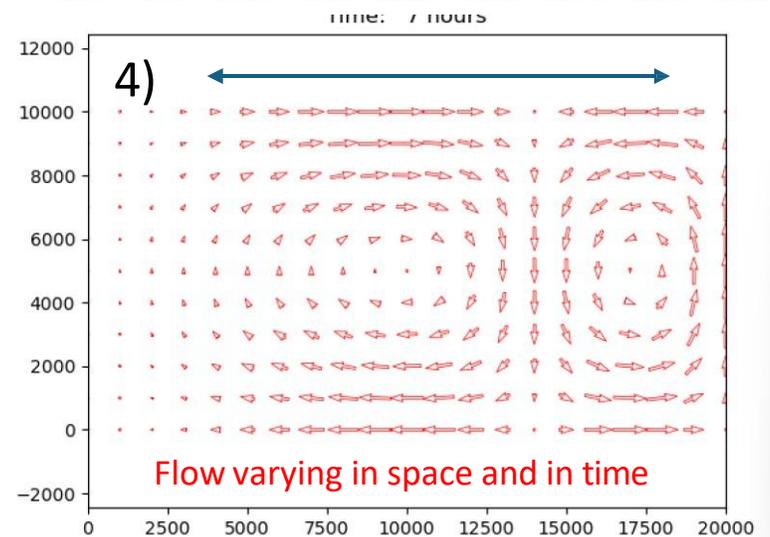
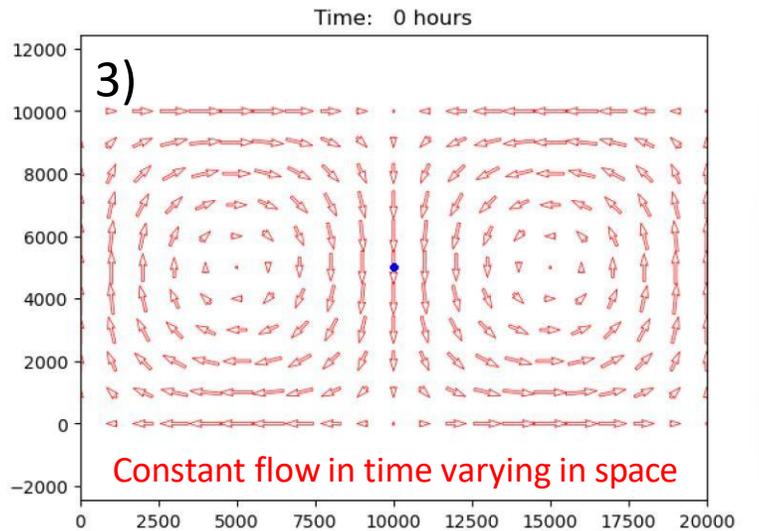
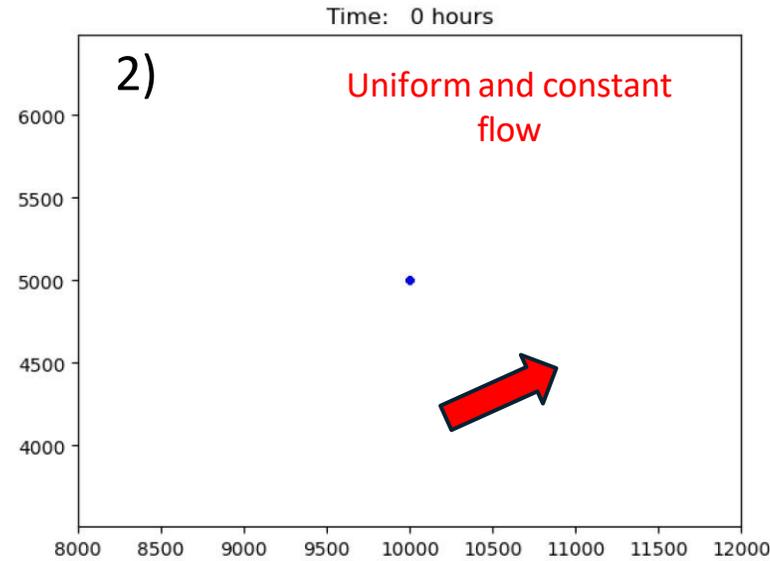
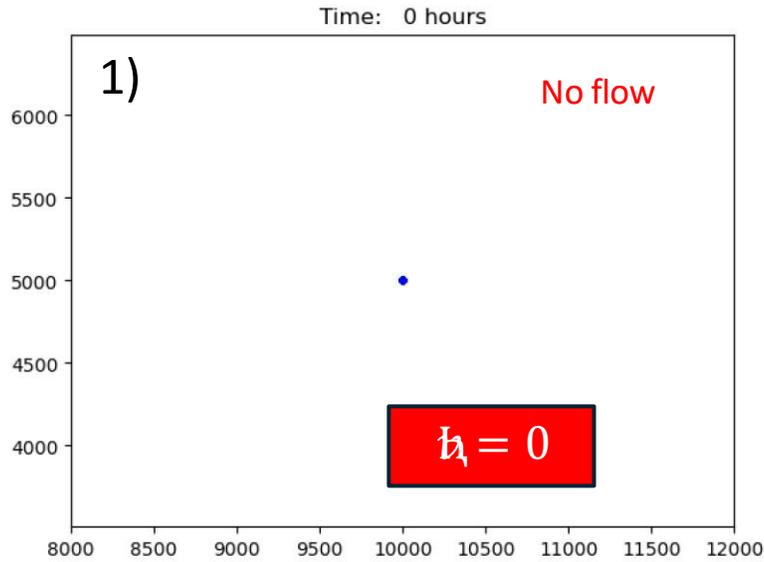
$$\mathbf{u}'_n = \alpha_1 \mathbf{u}'_{n-1} + \alpha_2 \mathbf{u}'_{n-2} + \dots + \alpha_p \mathbf{u}'_{n-p} + \hat{\mathbf{v}},$$

Where $\hat{\mathbf{v}}$ is a stochastic velocity, purely random and stationary

In an $AR(0)$ model the “turbulent” velocity is purely random at each timestep, i.e.:

$$\mathbf{u}'_n = \hat{\mathbf{v}}$$

Python scripts to assess dispersion



Increasing complexity to arrive to the realistic case

Multistep approach



Dispersion simulations

Particle model: GNOME

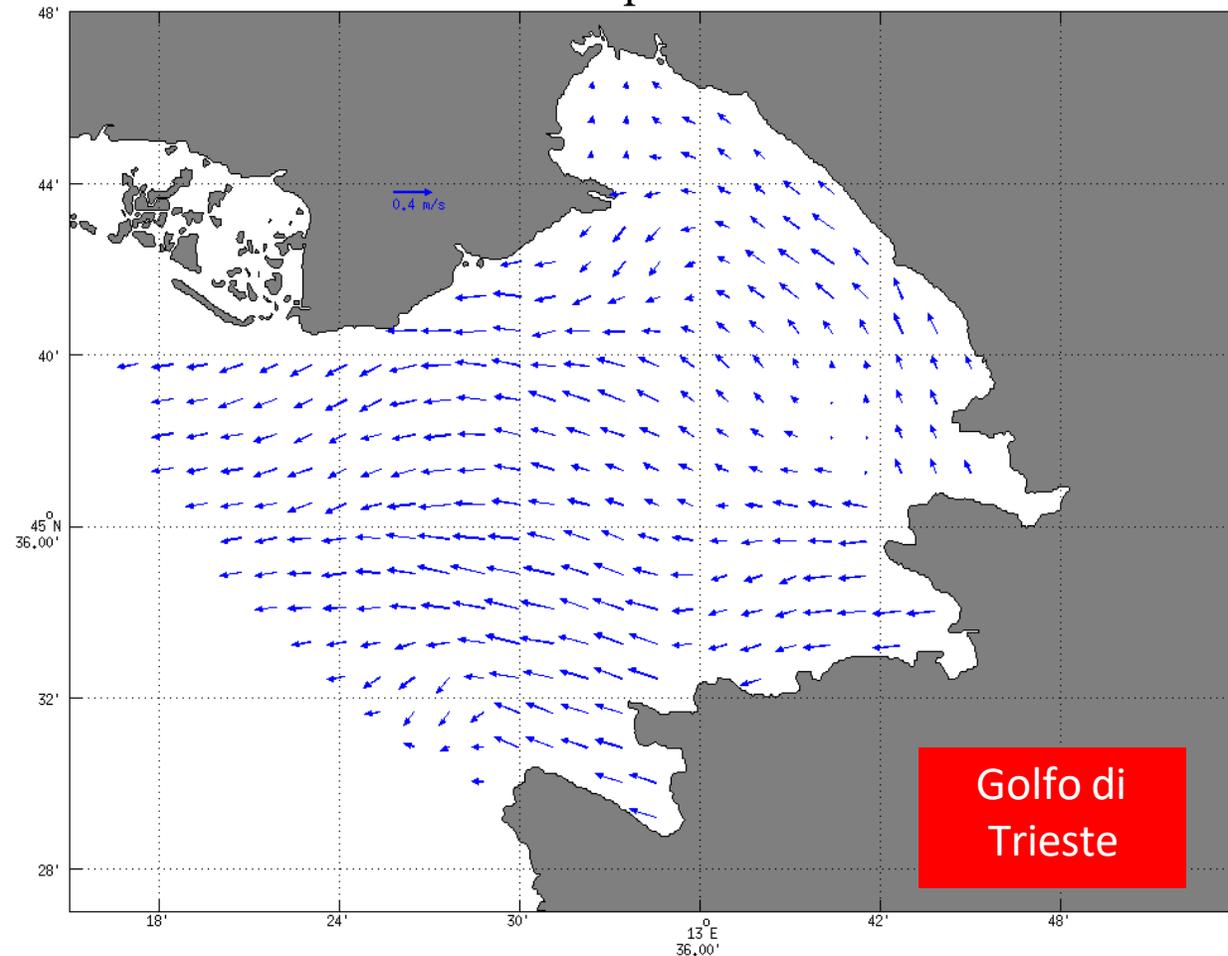
Reseeded every 24h

Radar measured currents **in blue**

Observed drifter trajectories drifter **in black**

Simulated virtual particle trajectories **in gray + red dots**

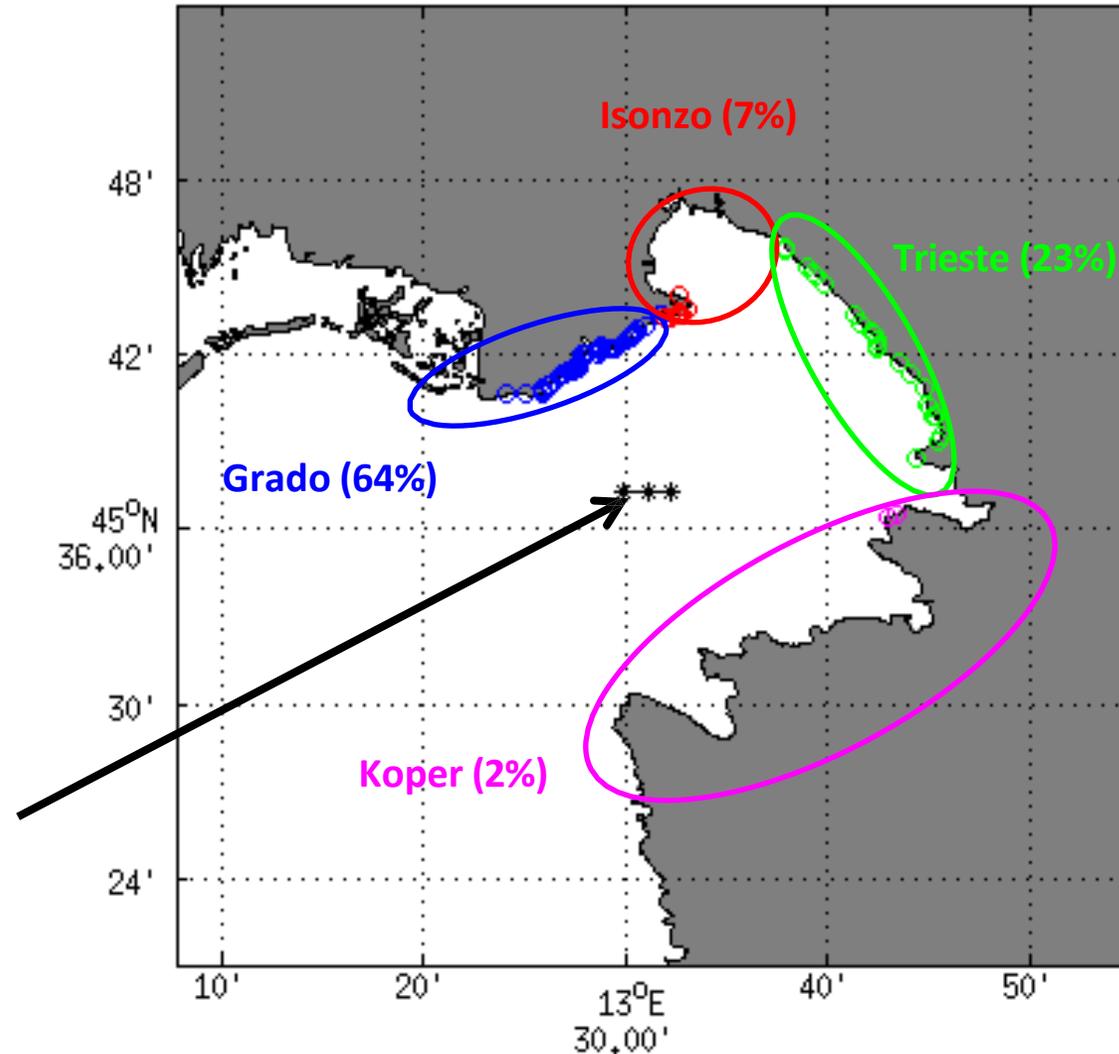
23-Apr-2012



Courtesy of Dr. Laura Cimoli, Ph.D. at Oxford University
Now at Cambridge

Dispersion scenarios

Most of the particles reach the area of Grado and Trieste



Position of a potential oil spill or spawning events



Courtesy of Dr. Laura Cimoli, Ph.D. at Oxford University
Now at Cambridge



THANKS!

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