



Turbulent Times

Collection of data for turbulence measurements in a tidal sluice

Tidal Energy

What does tidal energy site conjure up in our minds?



- Areas with 'ranger (y)
- Areas (Skerries, Kyle Roca, Pentland Firth)



“CHALLENGING ENVIRONMENT”

Tidal Energy



The *Netherlands*?

Tidal range: 3.28 m

How about tidal sluices?

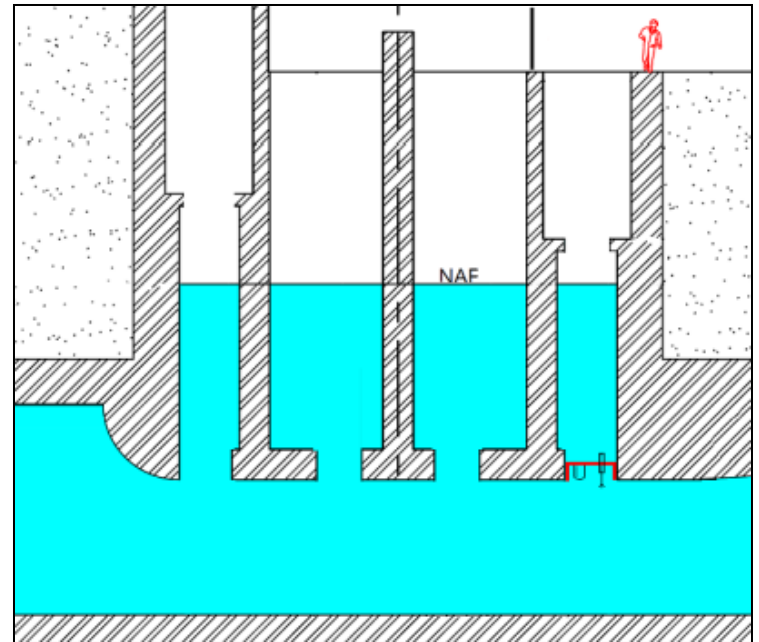
Benefits:

- Evenly distributed energy
- The gates can be shut!

Disadvantages

- No energy production if the gates are shut.
- Access complications

Location



Instrumentation



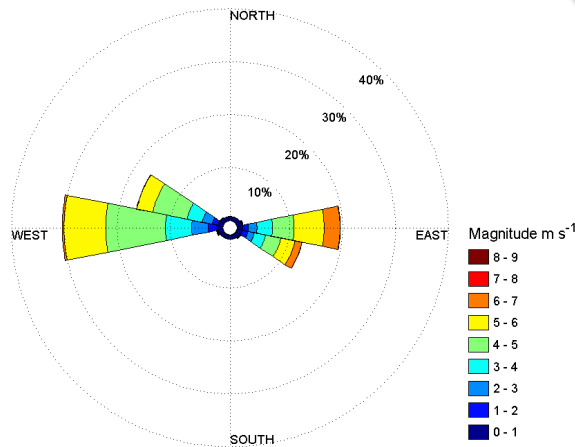
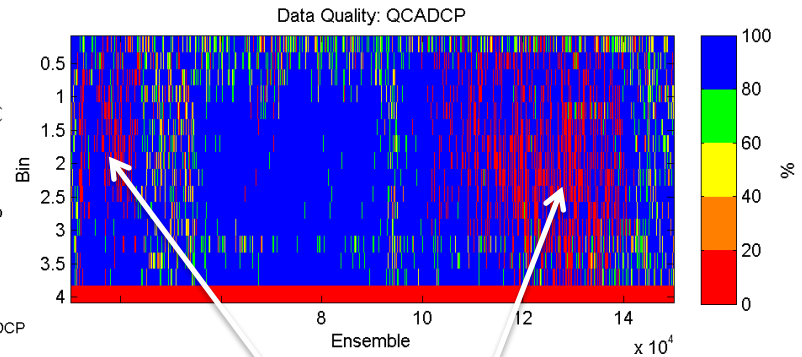
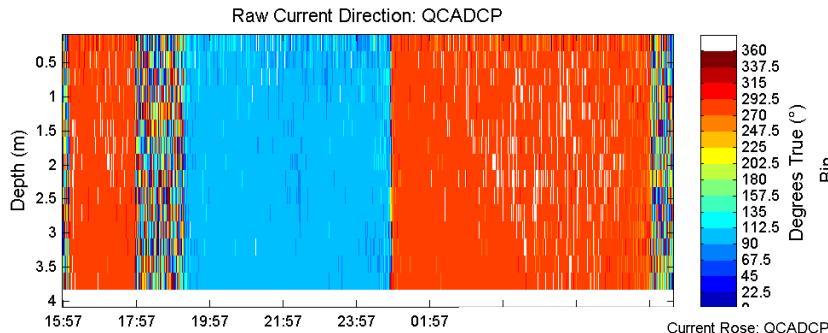
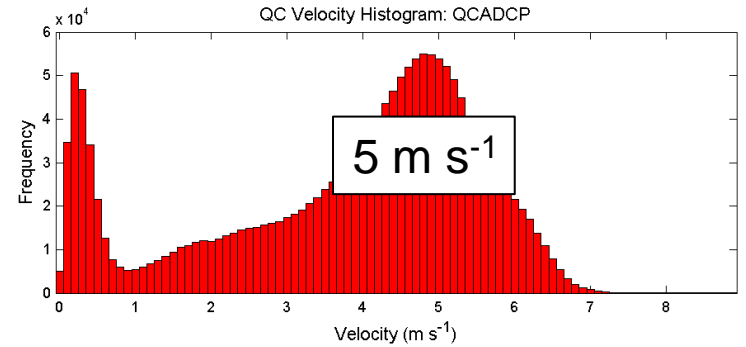
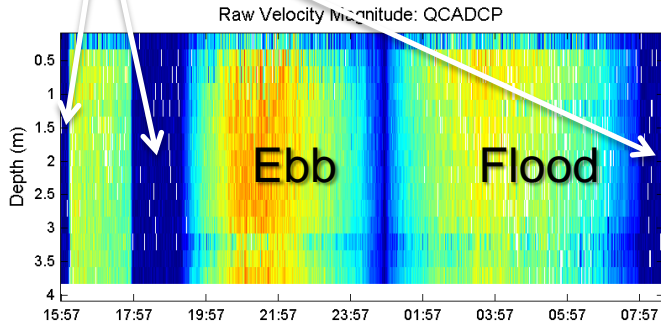
- 1 Nortek Vector sampling at 8 Hz



- 1 RDI 1200 kHz ADCP sampling at 2 Hz

Sluice gates shut

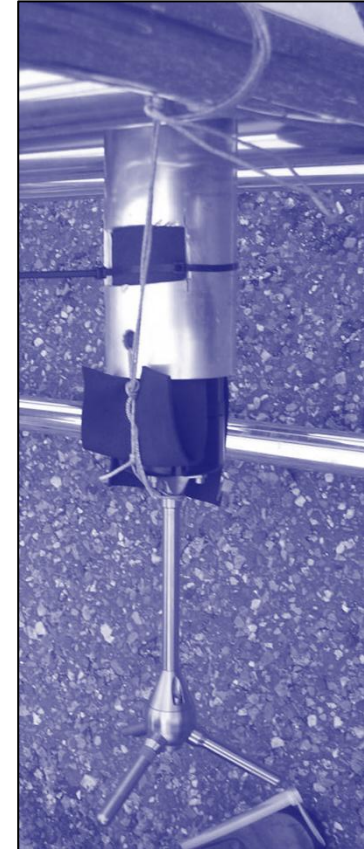
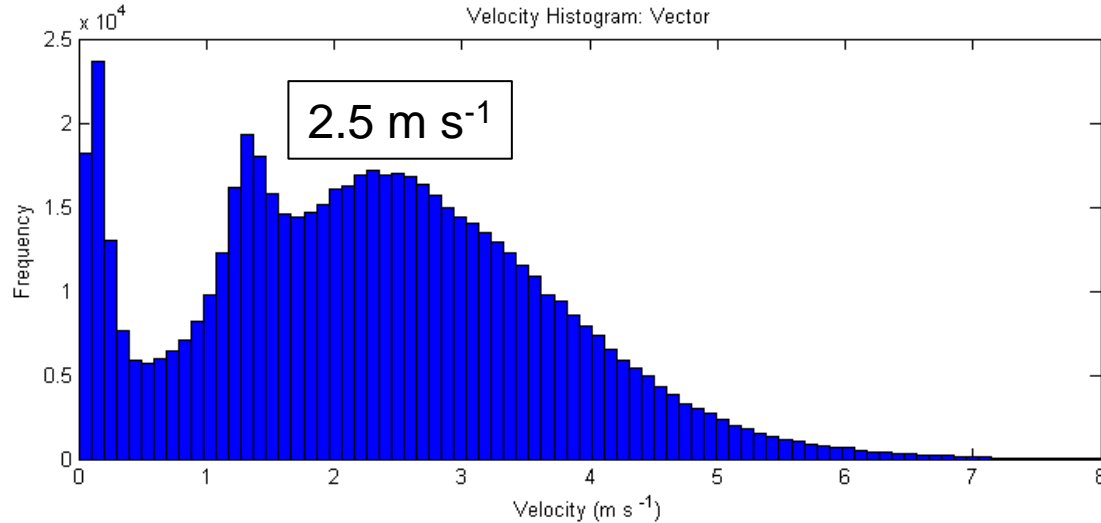
ADCP Results



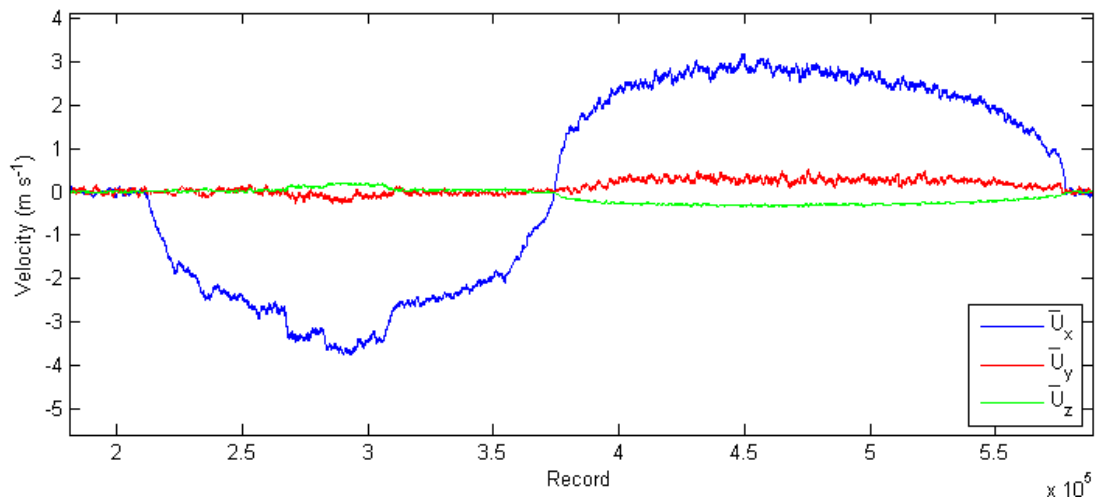
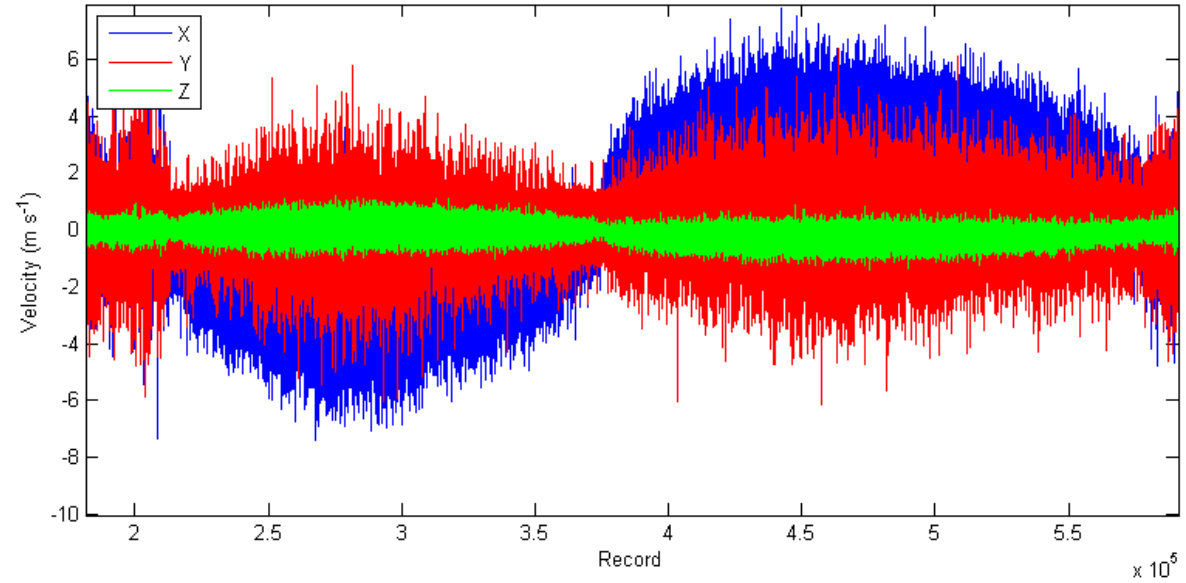
Bad data quality

Vector Data

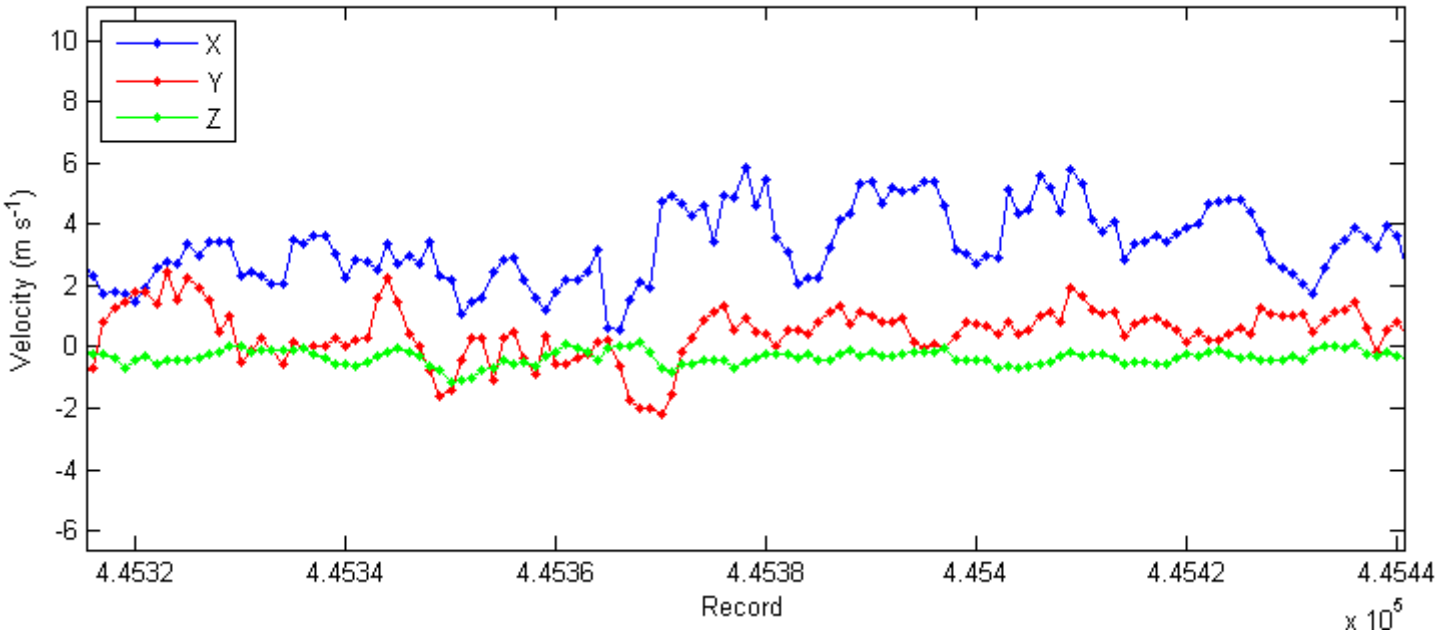
- 8 Hz Data
- Velocity ambiguity $\pm 7 \text{ m s}^{-1}$
- Data collected continuously for 21 hours
- Beam Coordinates



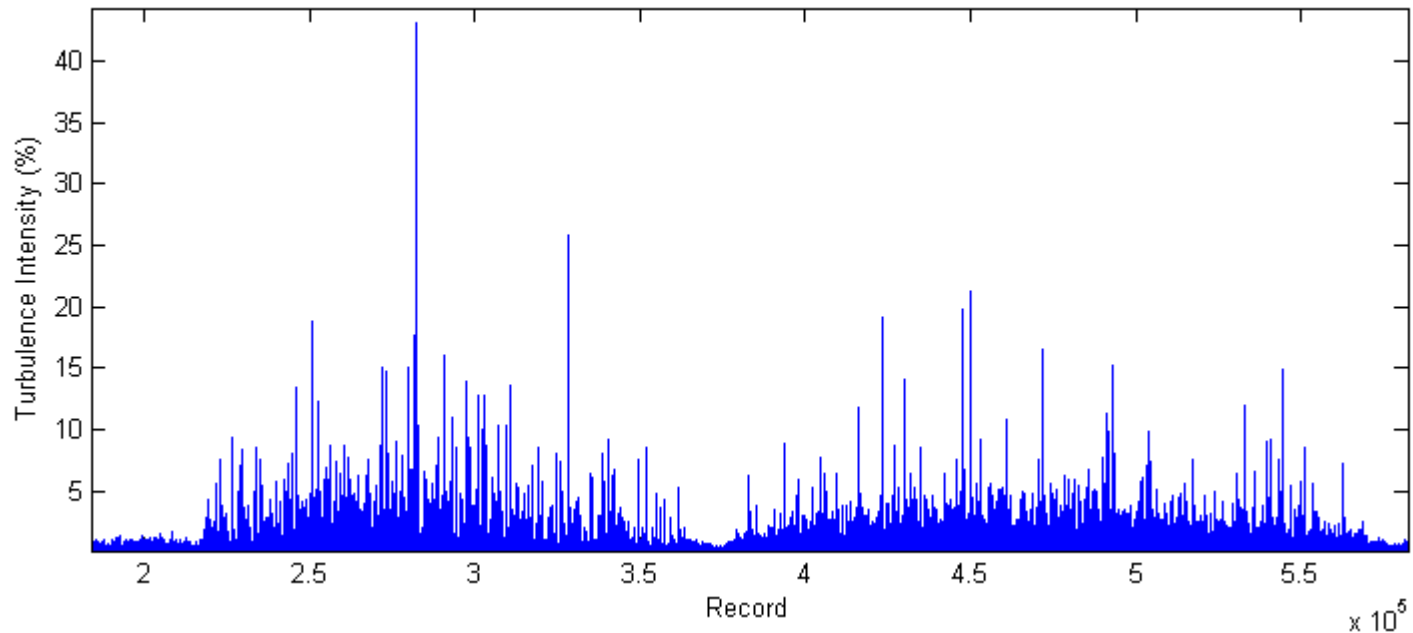
Vector Data



Closer Look



Turbulence Intensity

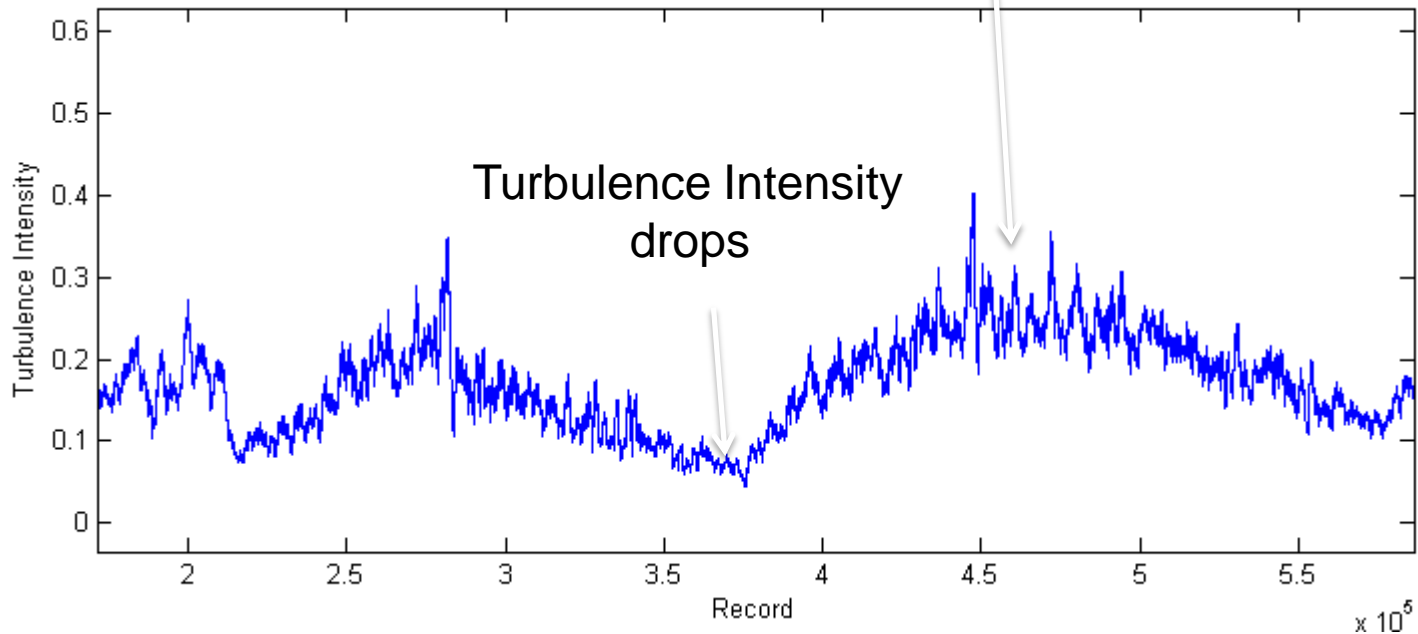


$$U_x = \overline{U}_x + U'_x$$

$$TI = \sqrt{\frac{1}{3}(U'^2_x + U'^2_y + U'^2_z)}$$

Turbulence Intensity?

More turbulence = fits with ADCP



Conclusions

- Is the data too noisy?
 - What can we do to improve this at collection?
 - Reduce velocity ambiguity?
 - Reduce sampling rate?
- Double-edged sword :
 - The data is too noisy but despiking the dataset could remove the turbulent component of the velocity. How far is too far?

Fair's fair

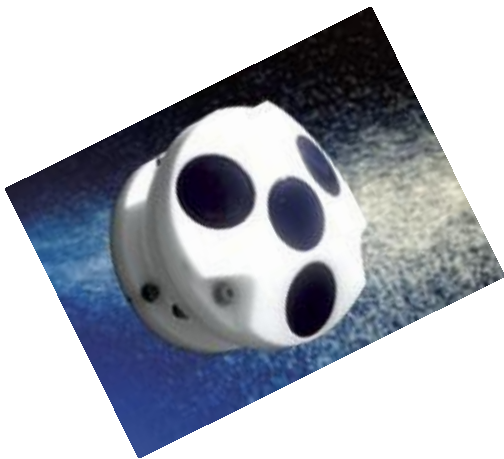
One
Norwegian
pint
courtesy of
Gordon
(thank you
Gordon)



=
(as promised)



Nortek Are Brilliant; buy
Nortek!:



PARTRAC
MARINE DATA EXPERTISE

Thank you!
Any Questions?

Except Robin.....

