

Modelling wave dynamic on jet currents in a flume

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CEMFJORD Accident (02.01.2015): The cause is unknown



The cargo ship *Cemfjord* capsized on 2 January 2015 in the *Pentland Firth* off the north-east coast of Scotland with the loss of her eight crew members without a distress call. The ship was 83 m long, 2,3 DWT. Although there was a gale force wind (~50mph), waves were moderate ($H_s \sim 3.7\text{m}$). The current in the strait was strong ($\sim 3\text{m/s}$). The depth is $\sim 70\text{ m}$.



South Africa

Madagascar

Maputo

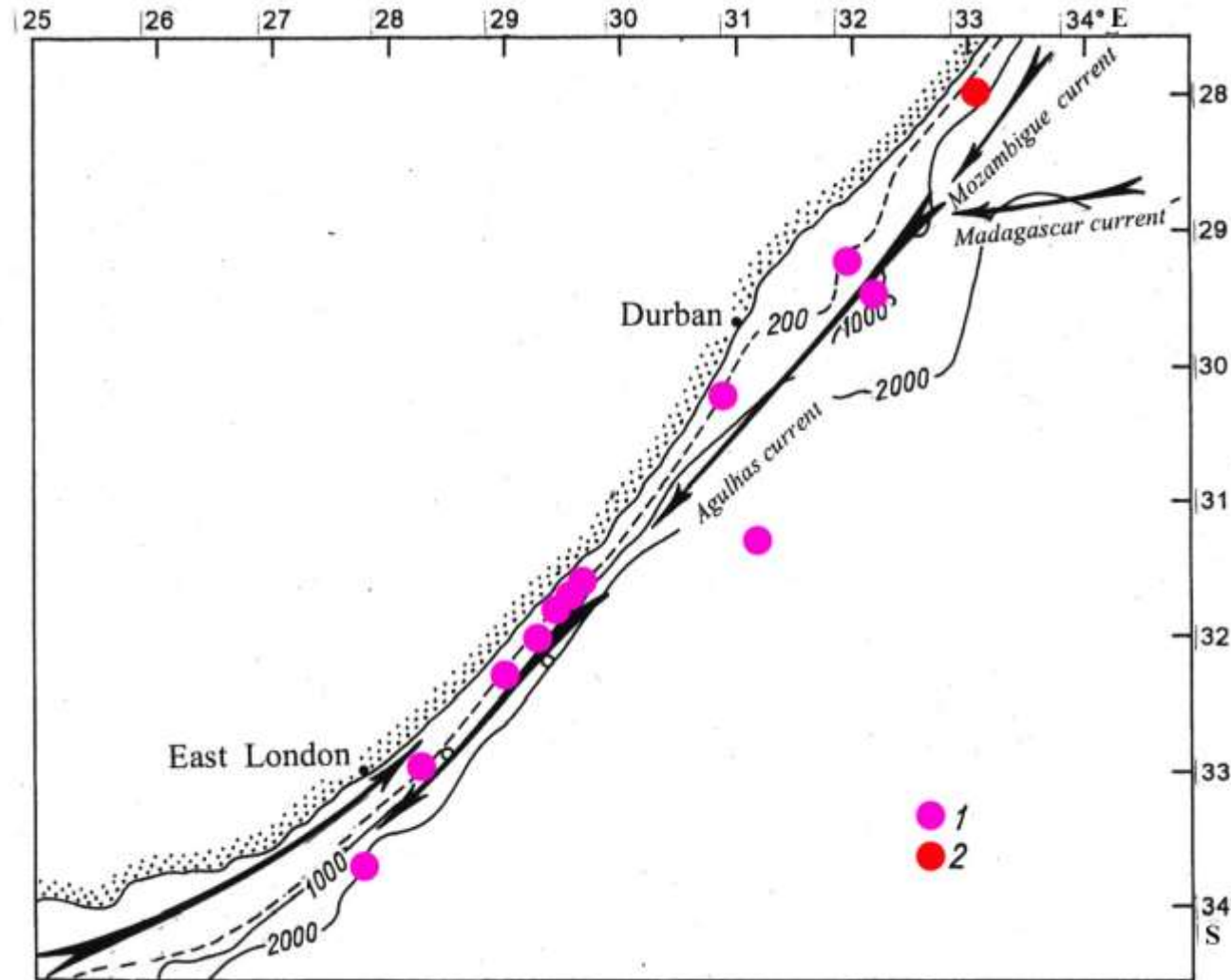
Durban

East London

Cape Town

Agulhas Current

Ship accidents on Agulhas current

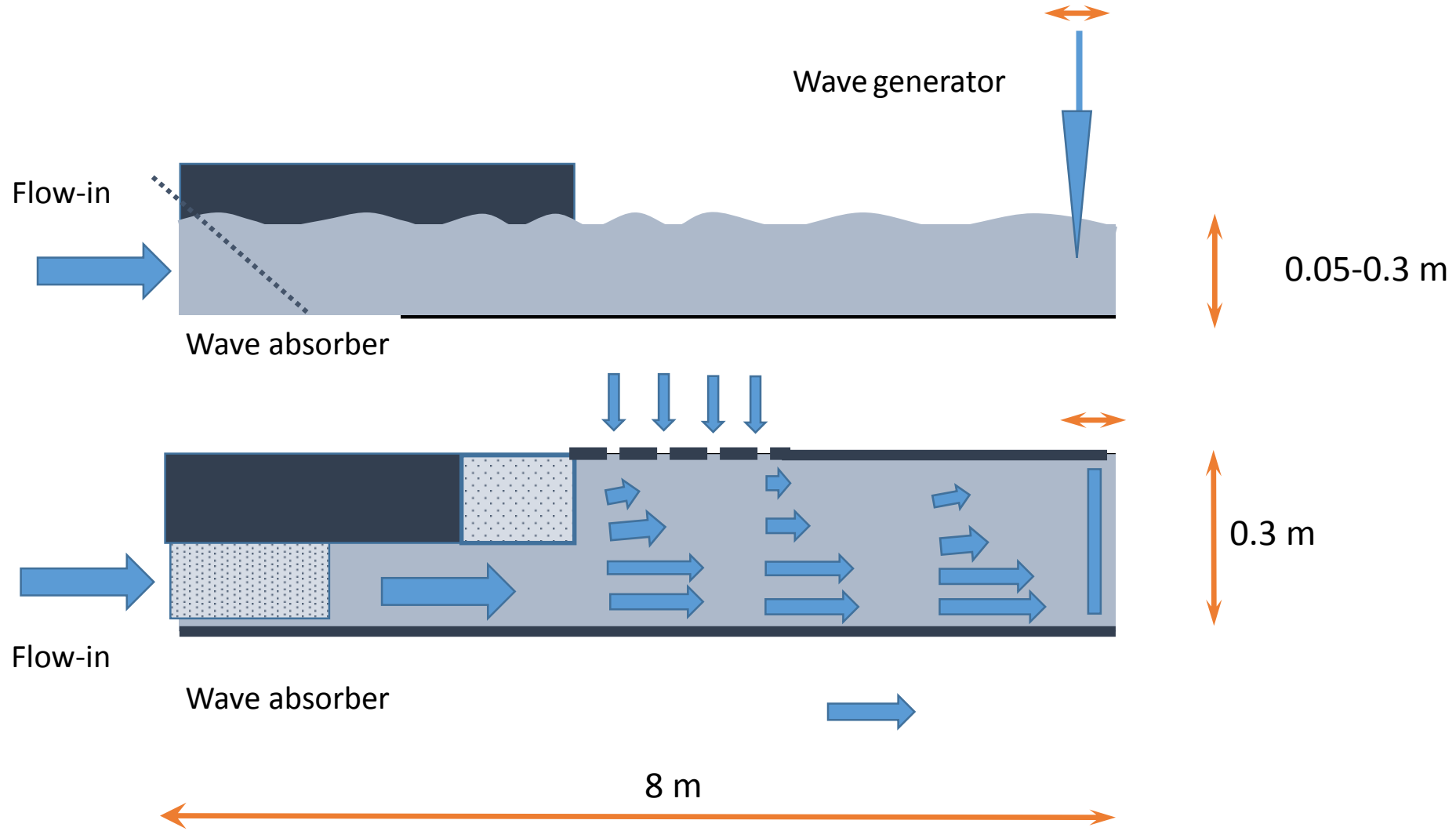


- Gaastekerck* (Apr'52)
- Oranjefontain* (Sep'53)
- Jagersfontain* (Dec'59)
- Edinburgh Castle* (Aug'64)
- World Glory* (Jun'68)
- Esso Lancashire* (Aug'68)
- Clan Maclay* (Oct'69)
- Southern Cross* (Oct'69)
- Moreton Bay* (Aug'71)
- Bencruachan* (May'73)
- Svealand* (Sep'73)
- Taganrogsky Zaliv* (Apr'85)

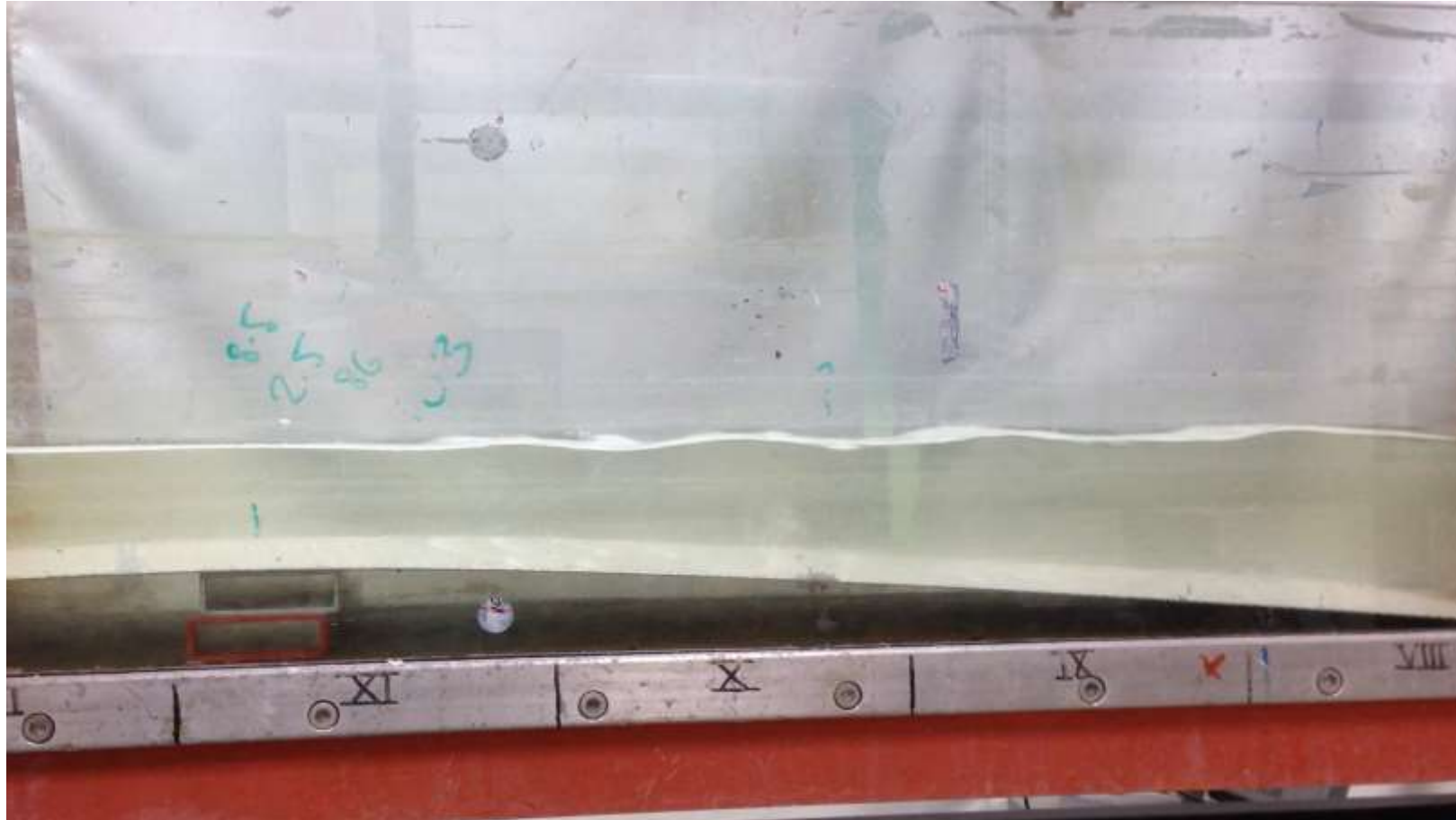
(Suez Canal was closed for 1967-1975, what caused more intense navigation along the coast of Africa)

[Mallory, 1974; Lavrenov, 1998]

Flow configuration



Blockage wave over a slope

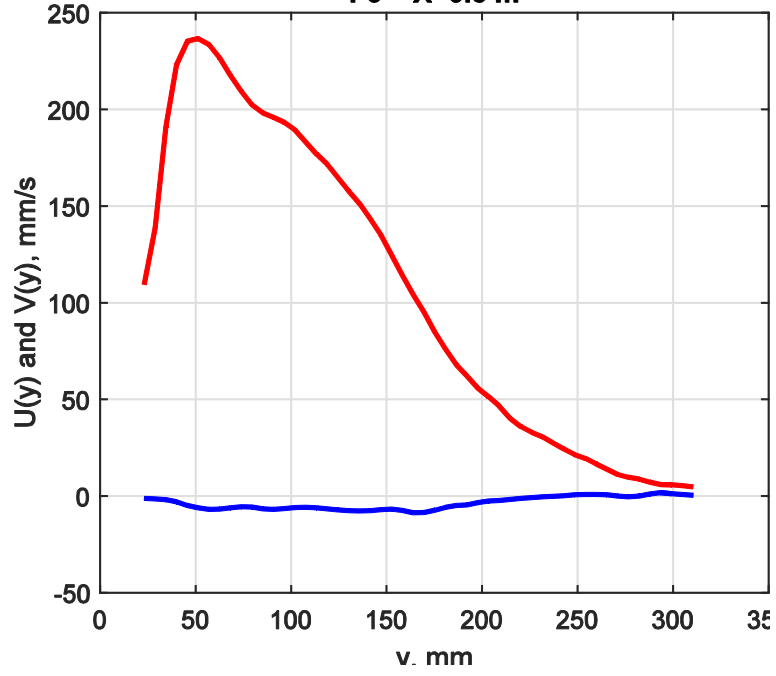


Separator

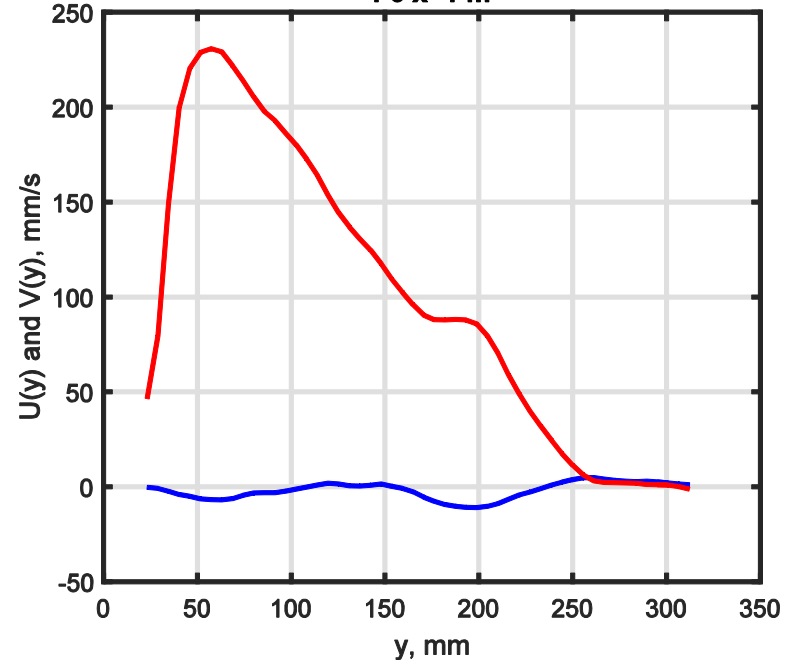


Flow profiles

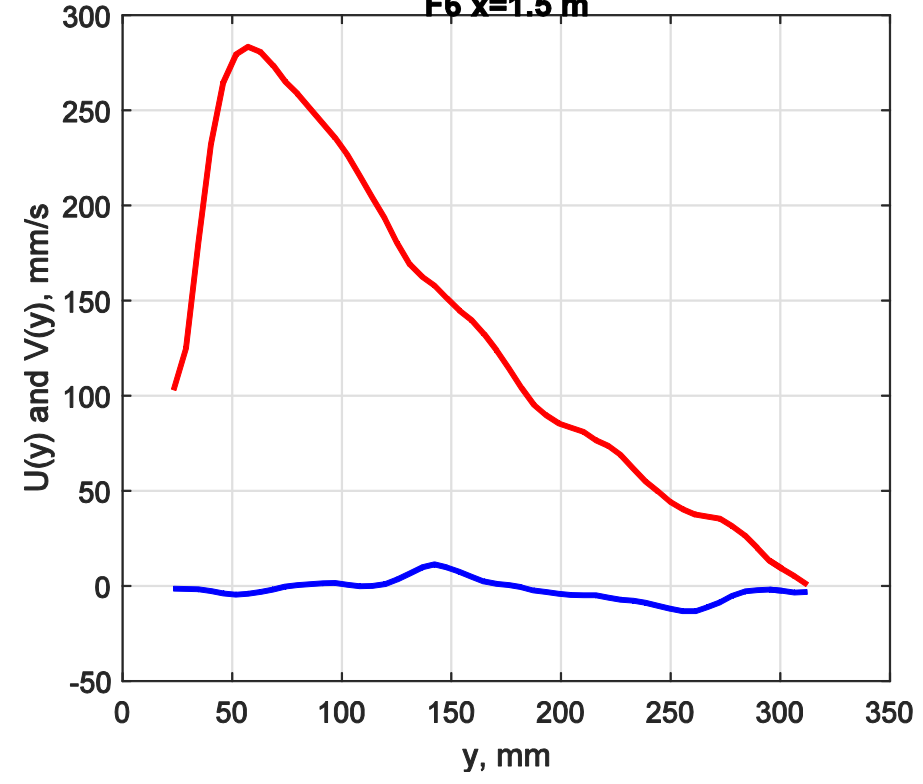
F6 X=0.5 m



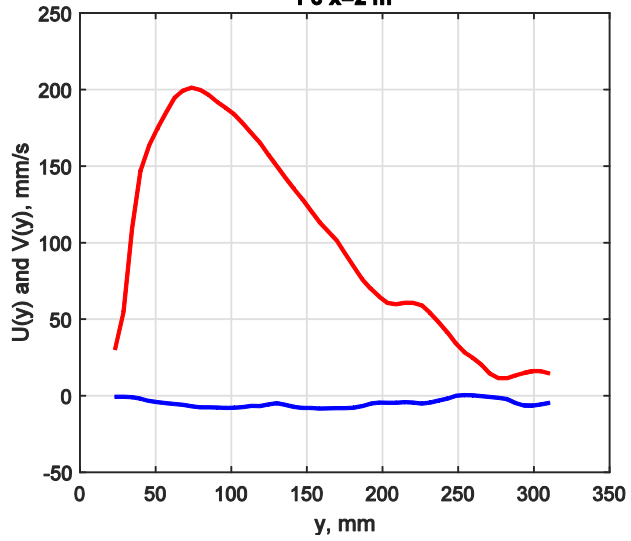
F6 x=1 m



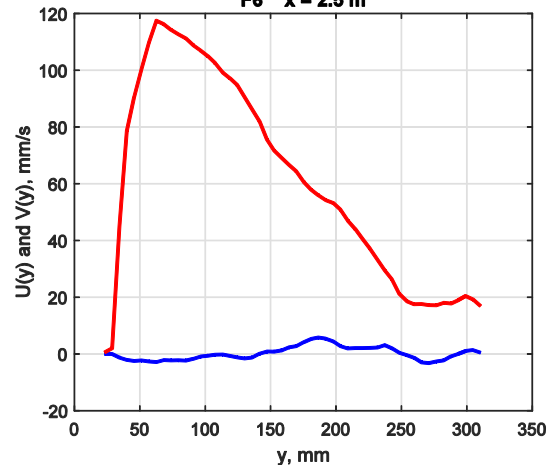
F6 x=1.5 m



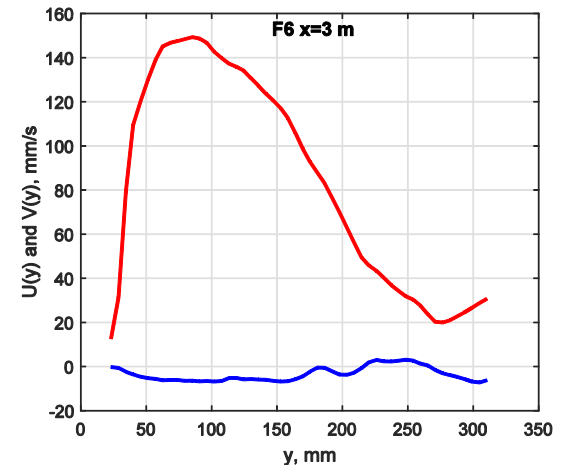
F6 x=2 m



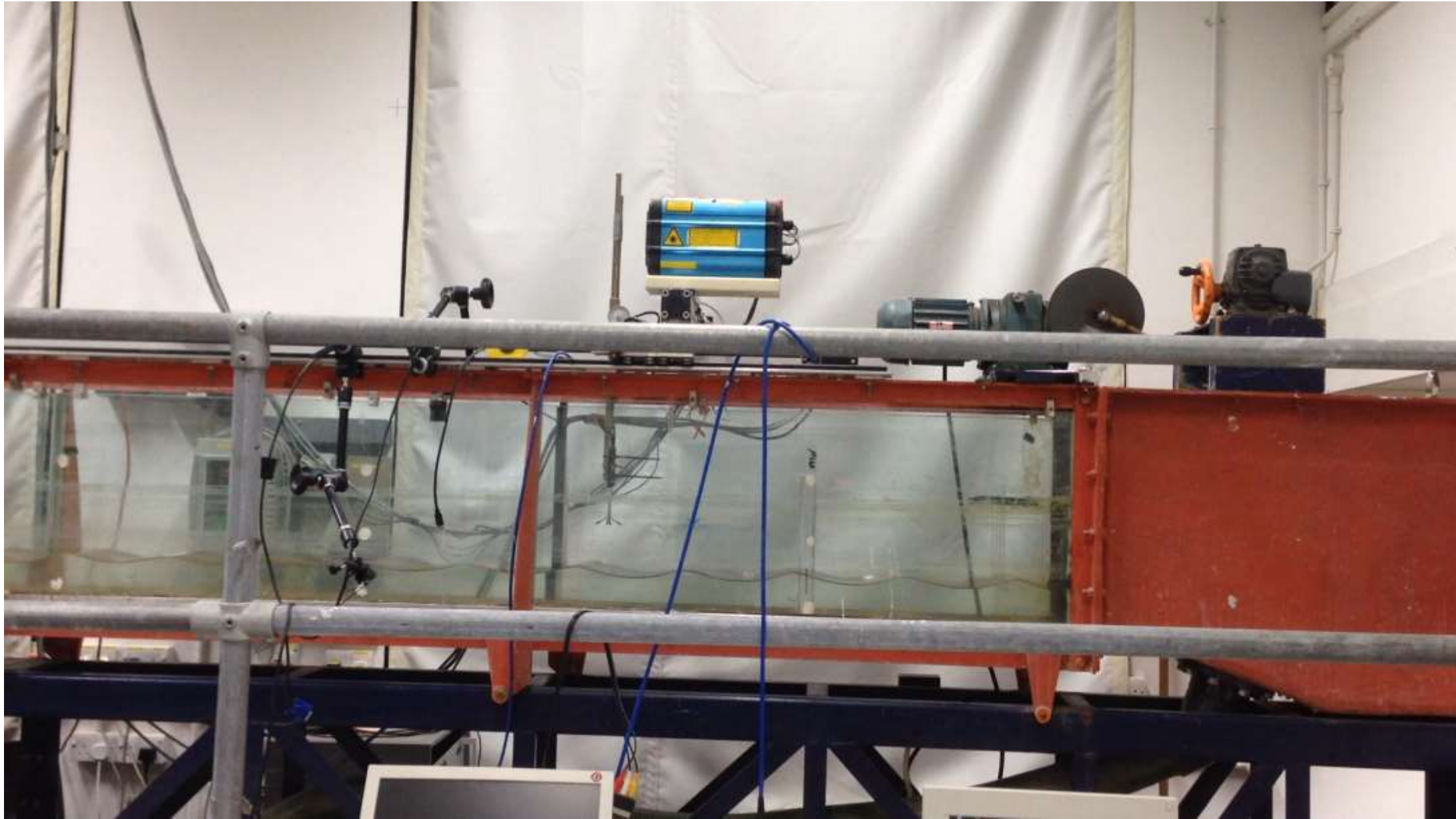
F6 x=2.5 m



F6 x=3 m



Flume



Braking waves at one side of the flume were the flow is greater



Conclusions

- This work opens a possibility to model jet currents in laboratory tanks
- Our project presents the first demonstration of trapped waves by a jet current
- Our observations show that many aspects of trapped waves dynamics can be studied in laboratory experiments
- This allows us to examine mechanisms of freak wave formation on jet currents