

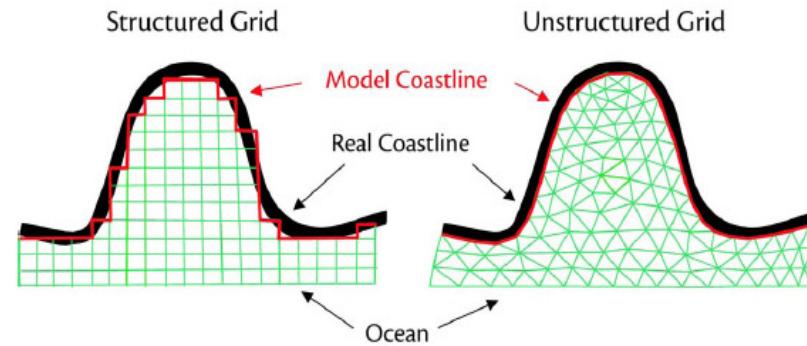
An unstructured-grid model of the Irish Sea based on FVCOM

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An introduction to FVCOM

- An unstructured-grid, finite-volume coastal ocean model developed at Massachusetts-Dartmouth (Chen et al, 2003)
- Hydrostatic ; terrain-following σ co-ordinate (similar to POM)
- FVCOM is solved by a second-order accurate discrete flux calculation in the integral form of equations
- Trace advection: MPDATA (Smolarkiewicz 2005); horizontal diffusion: Smagorinsky; vertical: Mellor Yamada closure scheme.
- Advantages include grid flexibility at complex coastal line, better conservation, etc.

Bergen 2009



Example of the continuity eq.

$$\begin{aligned} \iint \frac{\partial \zeta}{\partial t} dx dy &= - \iint \left(\frac{\partial u D}{\partial x} + \frac{\partial v D}{\partial y} \right) dx dy \\ &= - \oint V_n D ds \end{aligned}$$

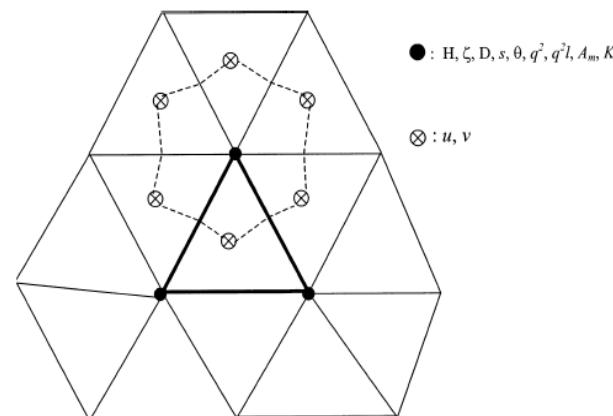
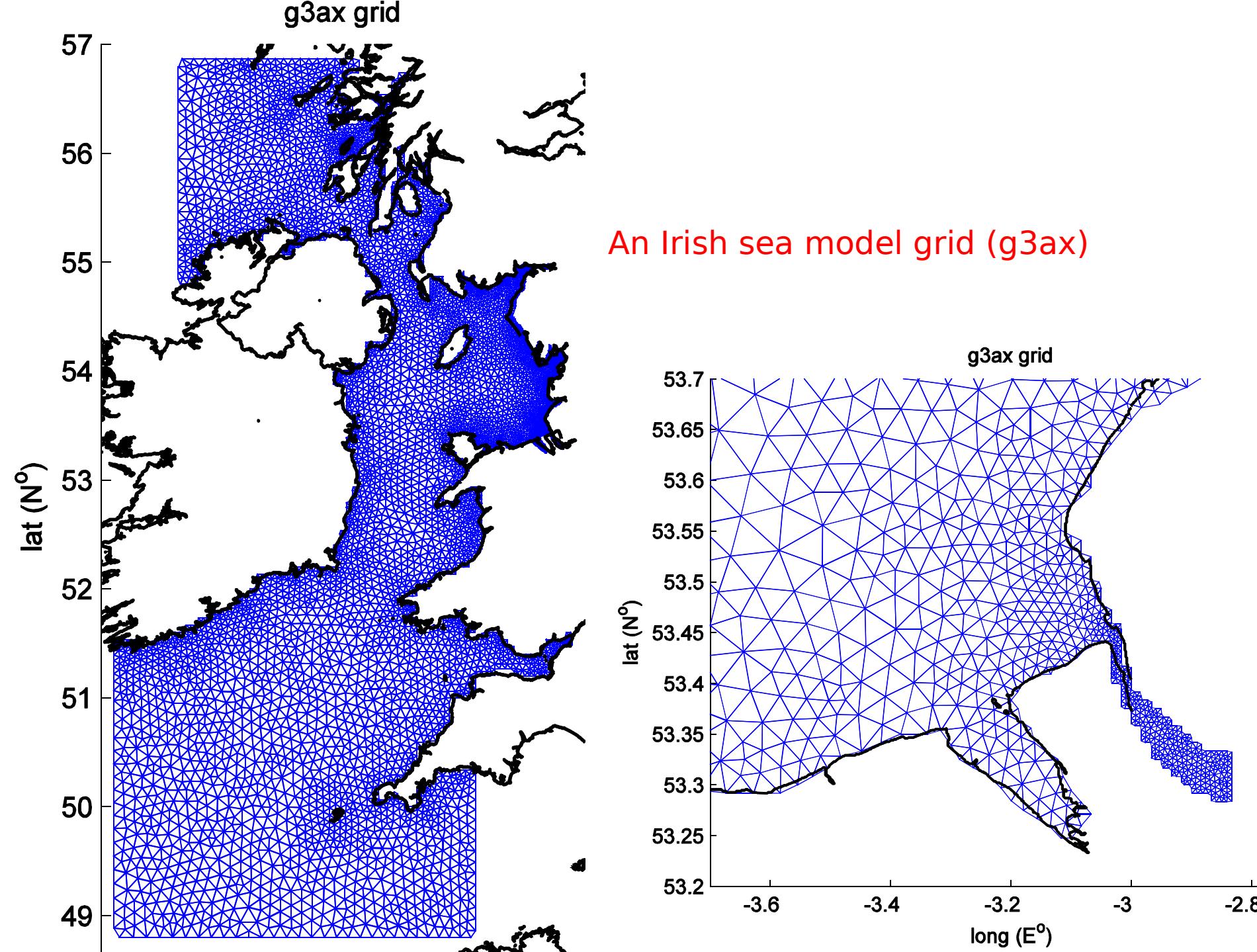
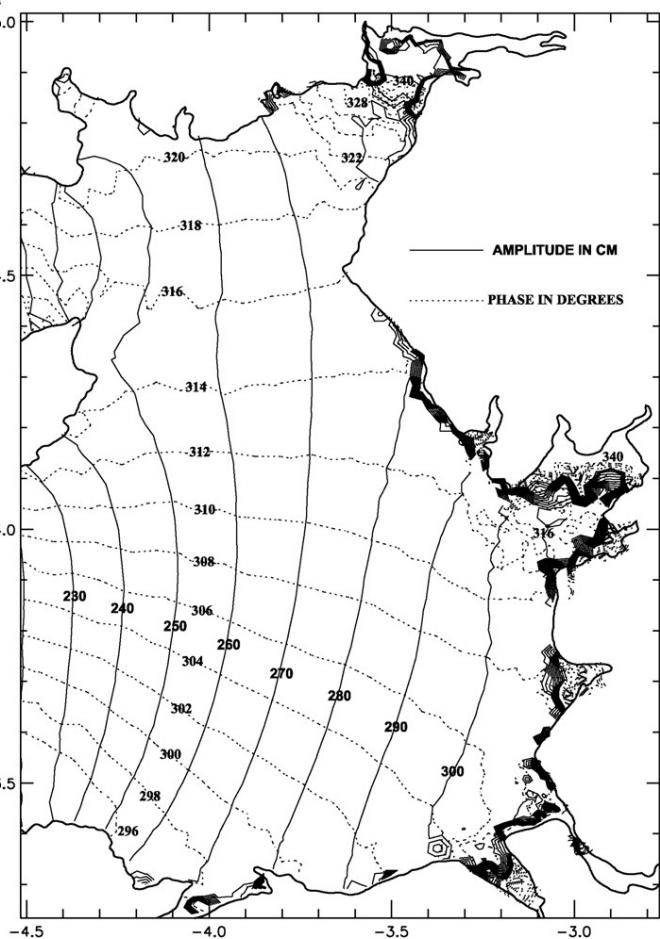


FIG. 1. The unstructured grid for the finite-volume model.

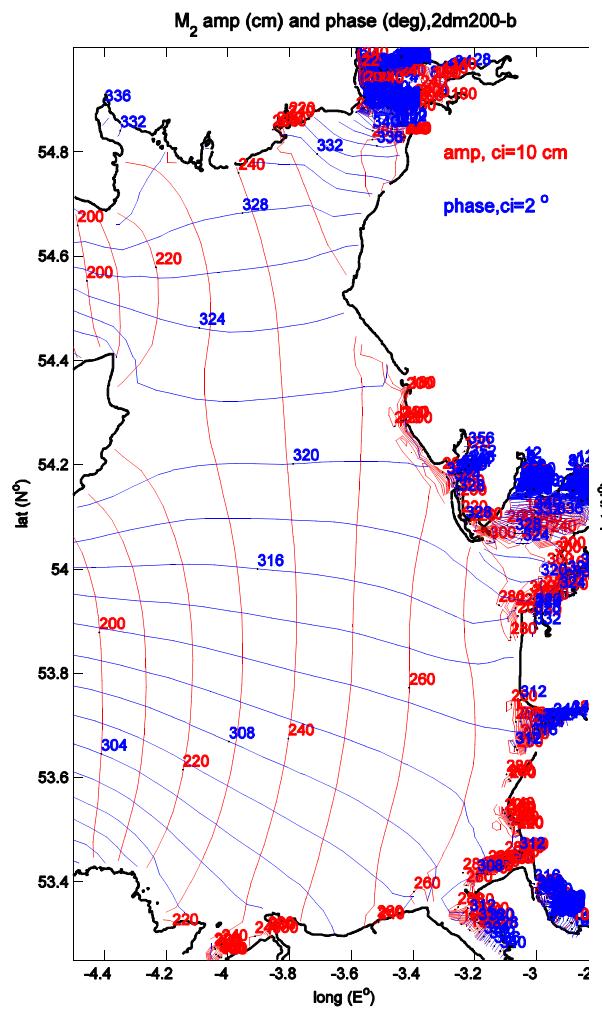


Computed M₂ tide over the Eastern Irish Sea

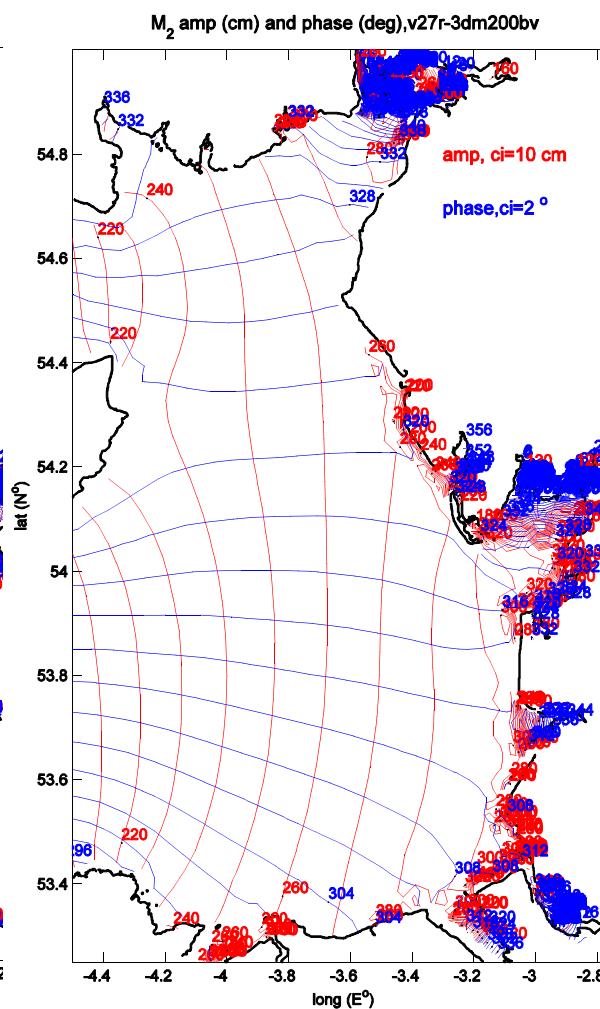
MAC 2D



FVCOM 2D

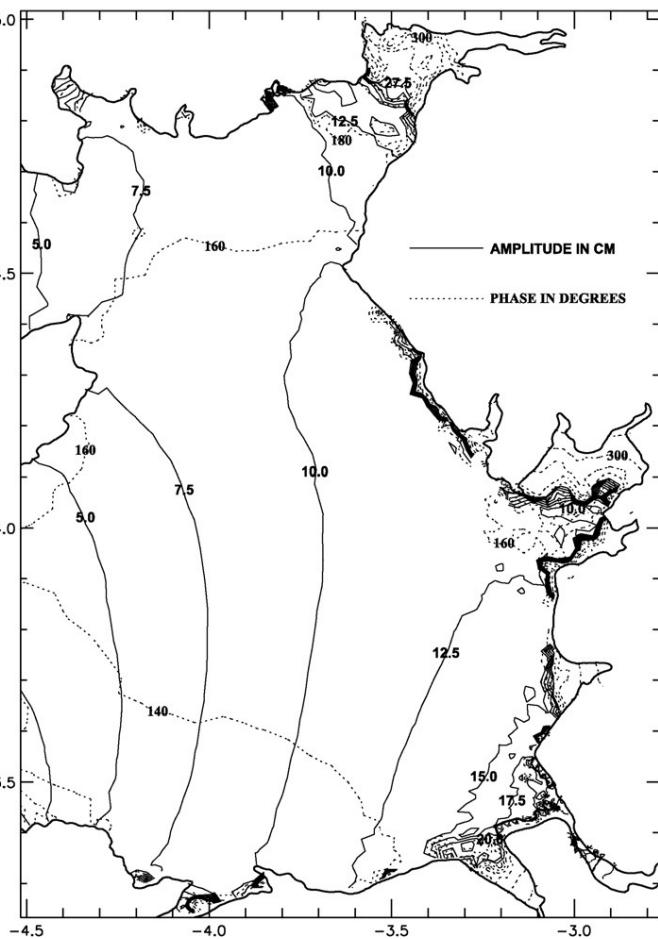


FVCOM

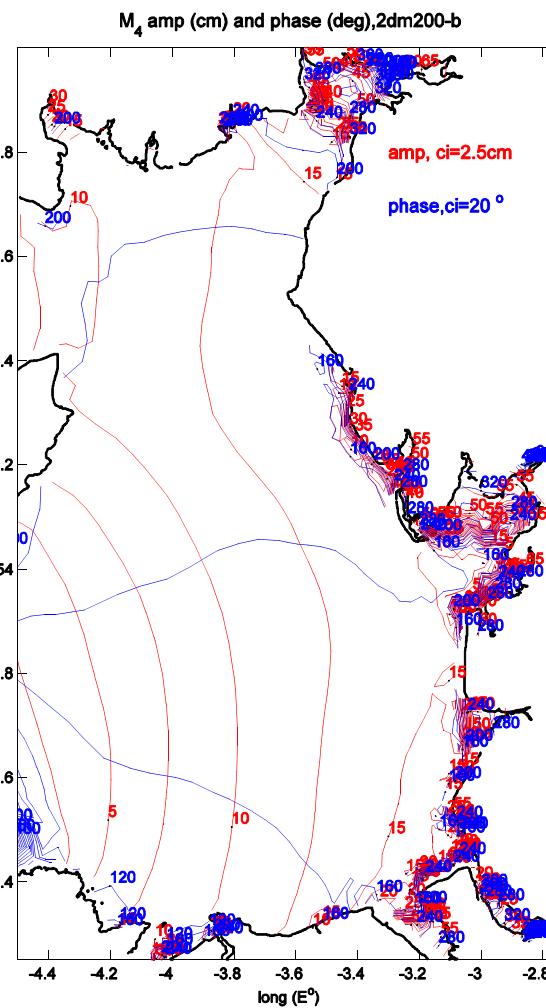


Computed M4 tide over the Eastern Irish Sea

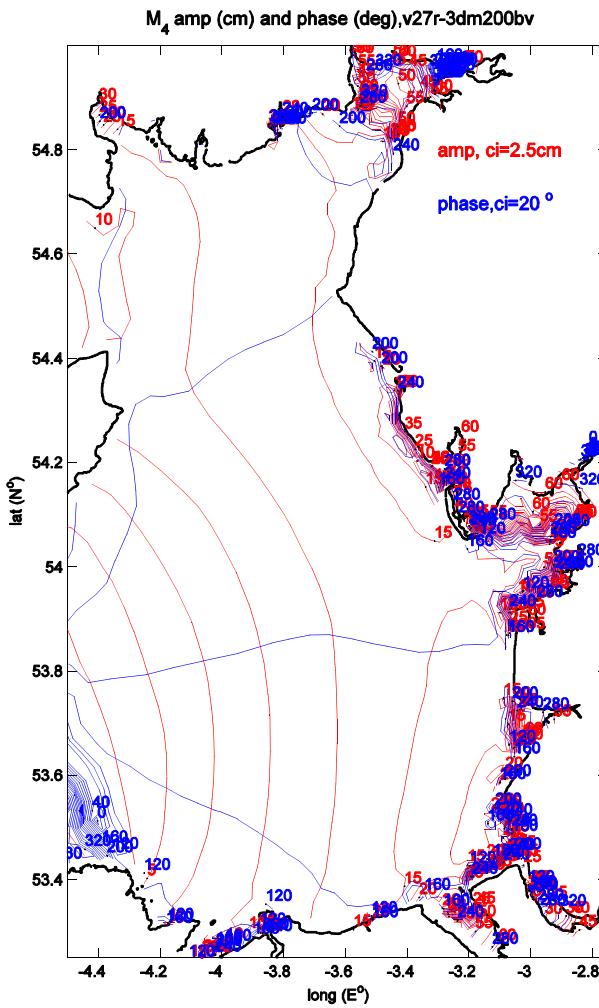
EMAC 2D



FVCOM 2D

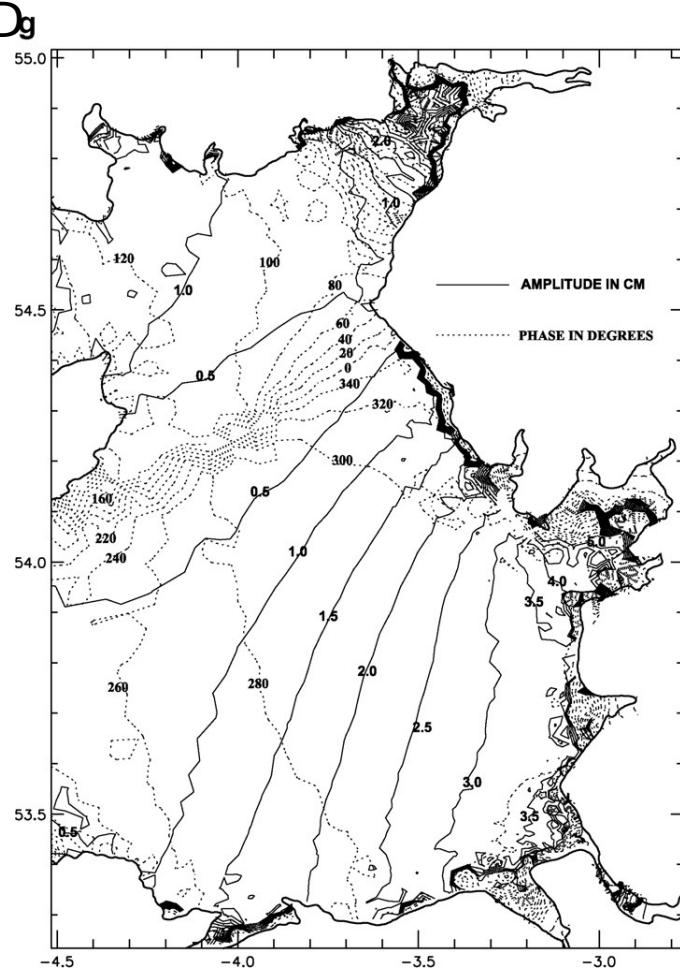


FVCOM

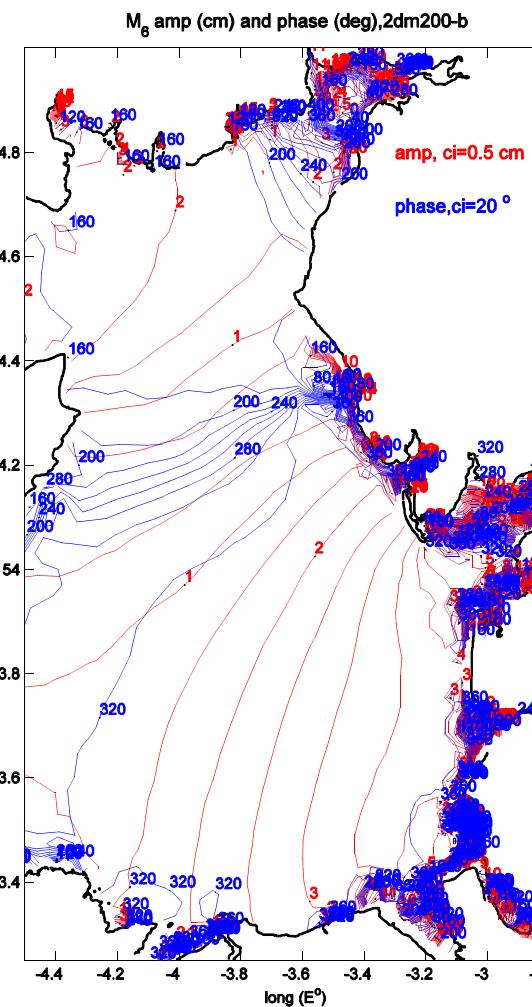


Computed M6 tide over the Eastern Irish Sea

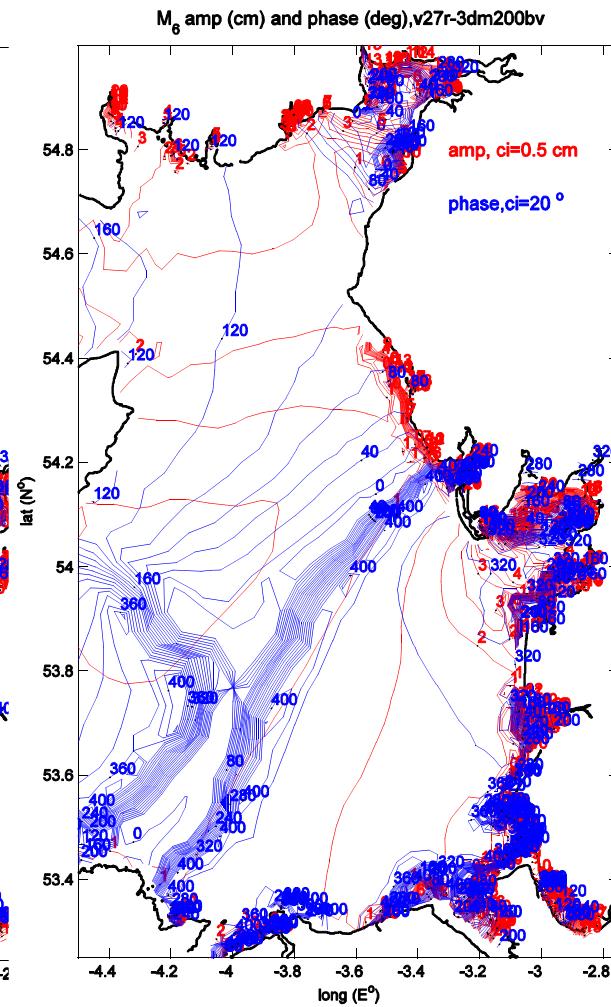
ELEMAC 2D



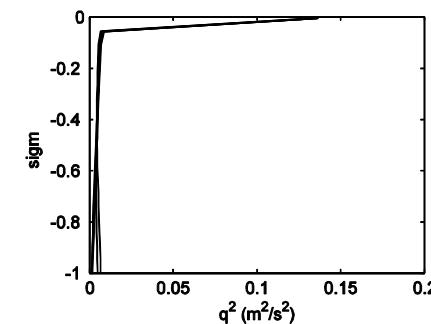
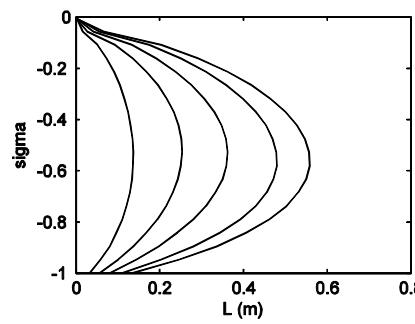
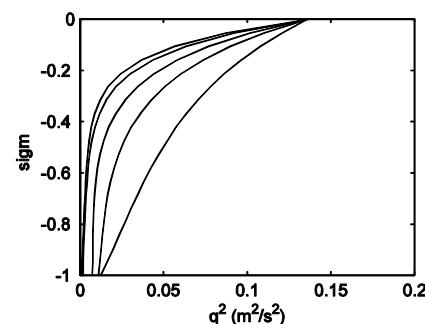
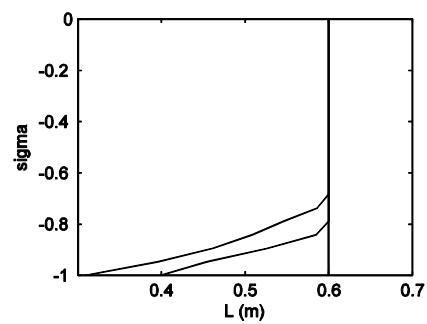
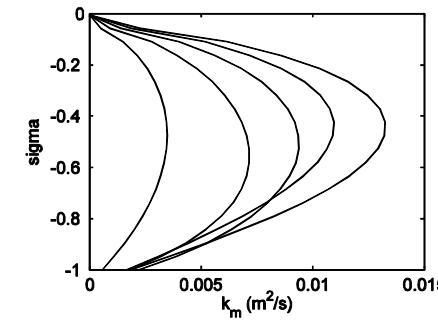
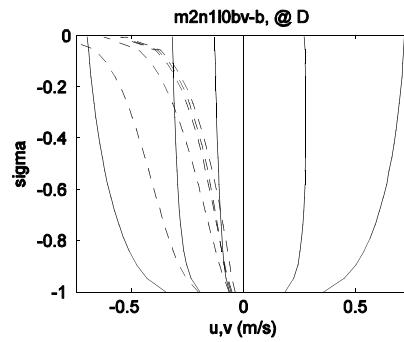
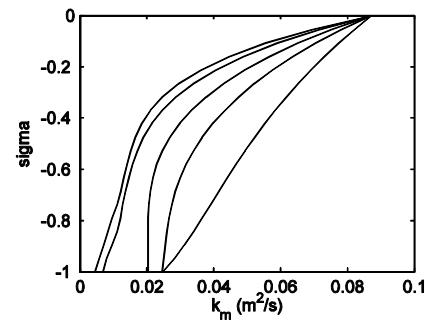
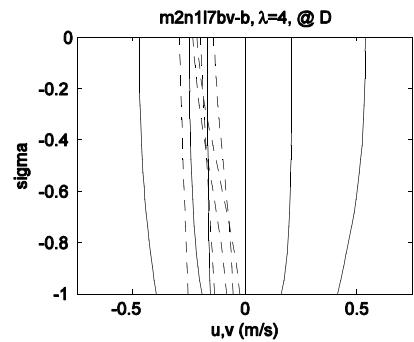
FVCOM 2D



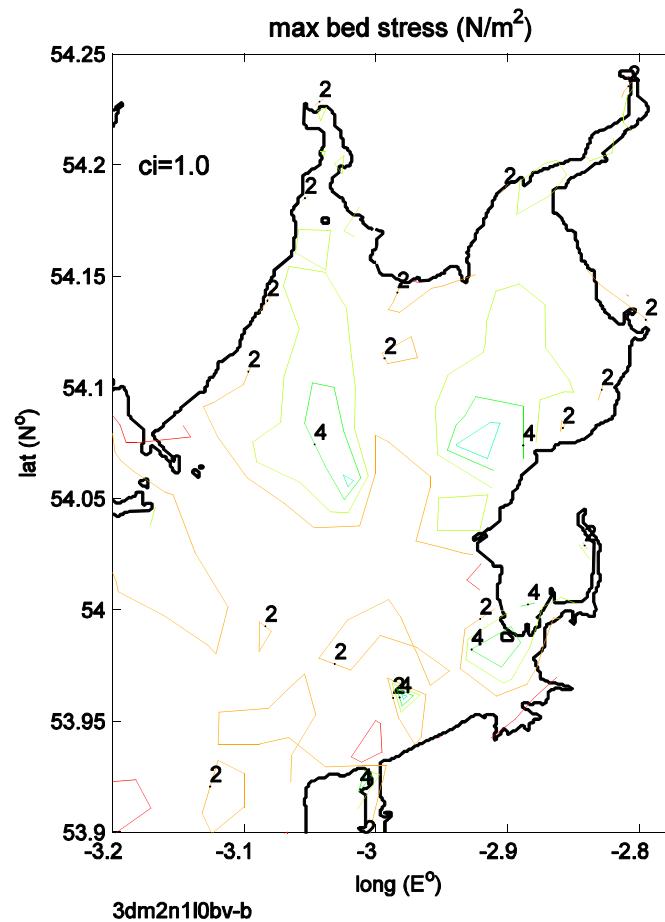
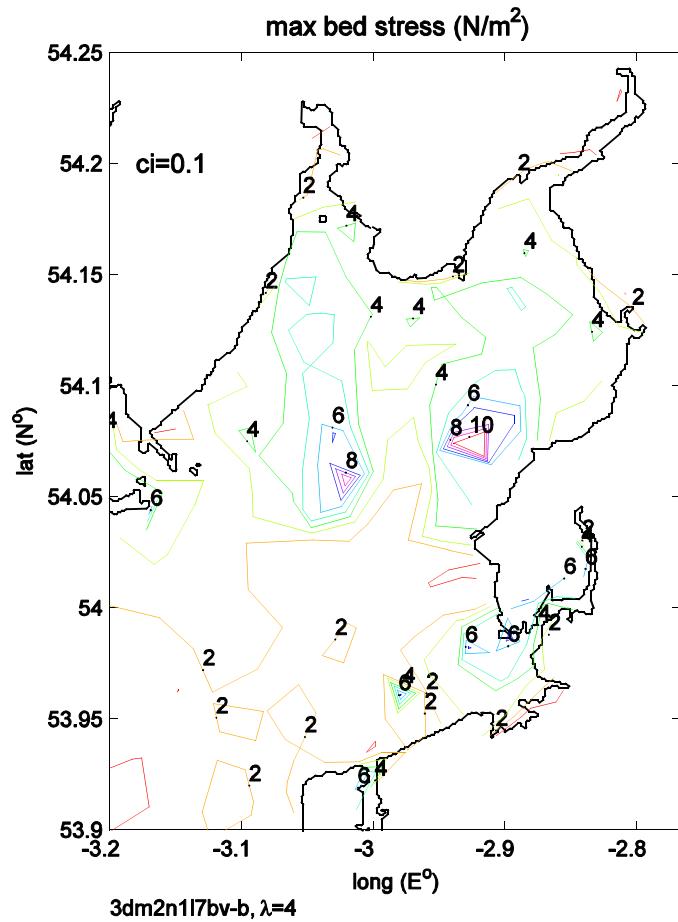
FVCOM



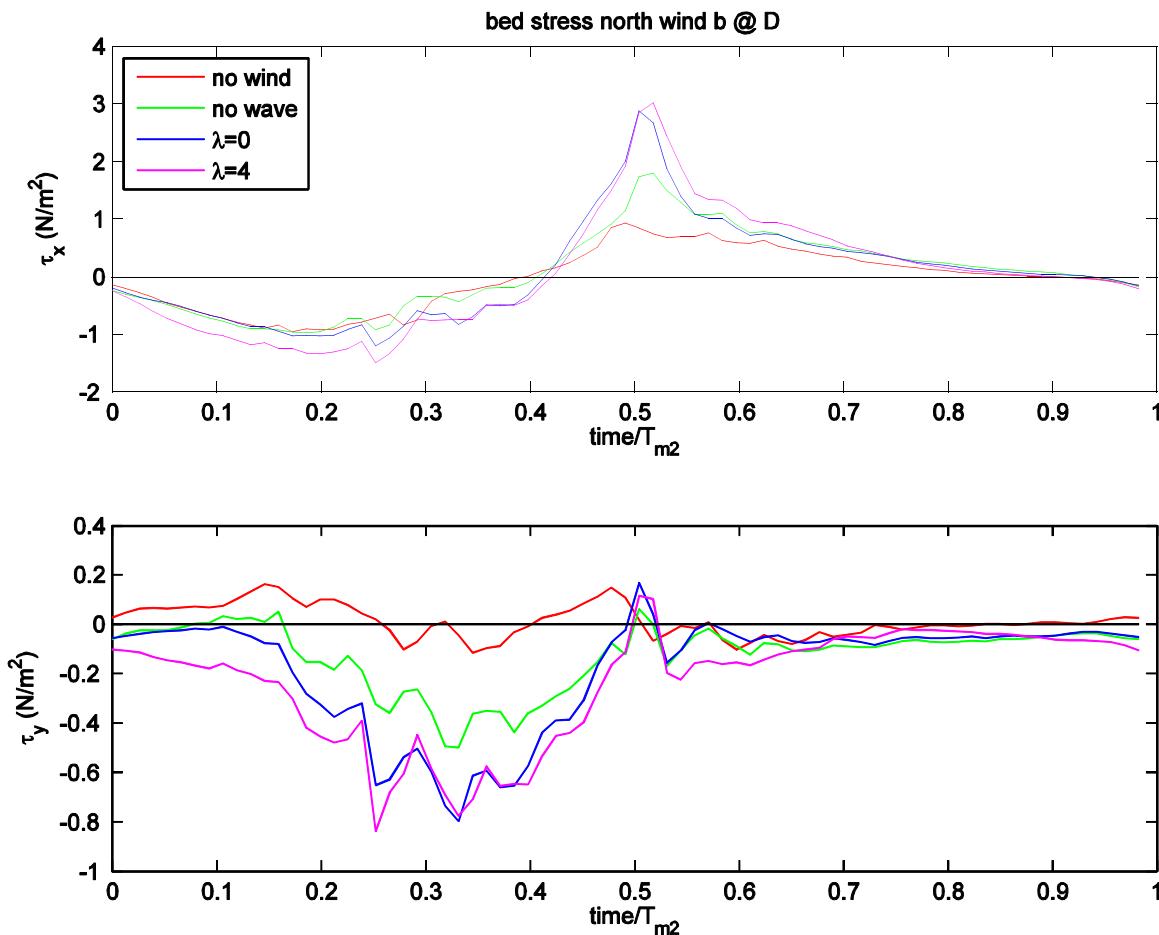
Effects of wave breaking parameterization on current profiles



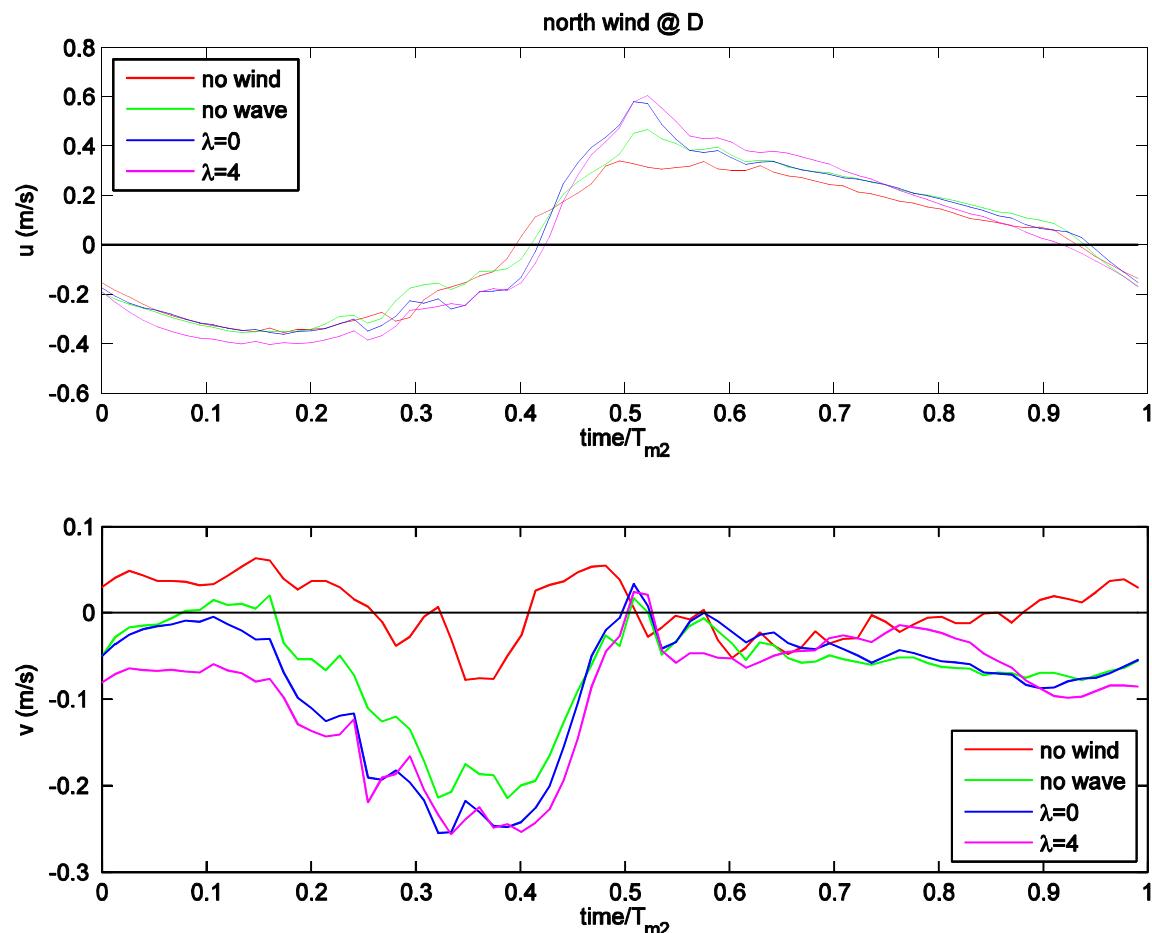
Effects of wave breaking parameterization on maximum bed stress in the shallow water region



Bottom stress at a location of Liverpool Bay

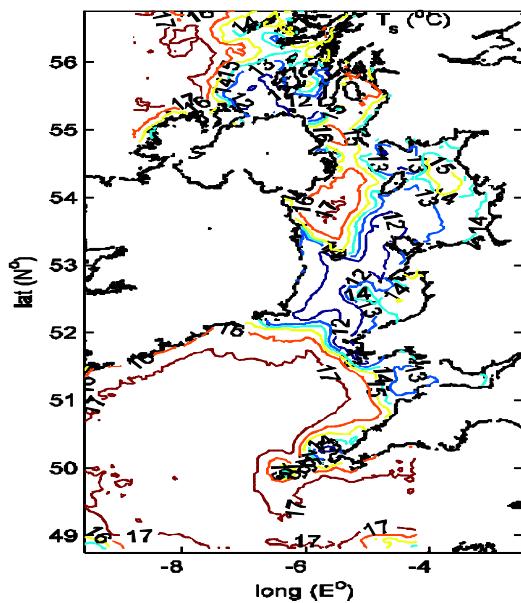


Surface currents with/without wind wave effects

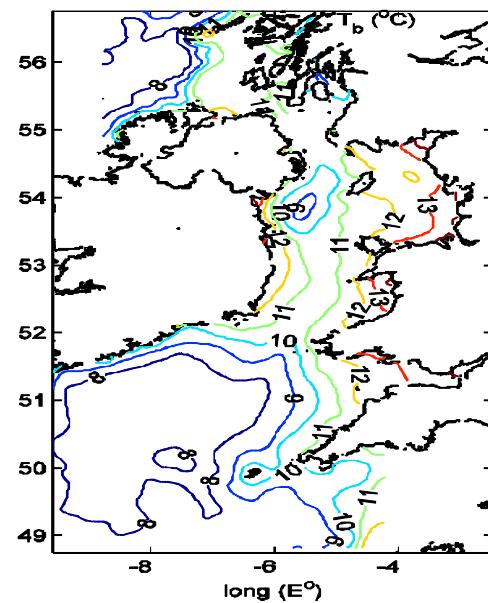


Temperature at 26 June 1995

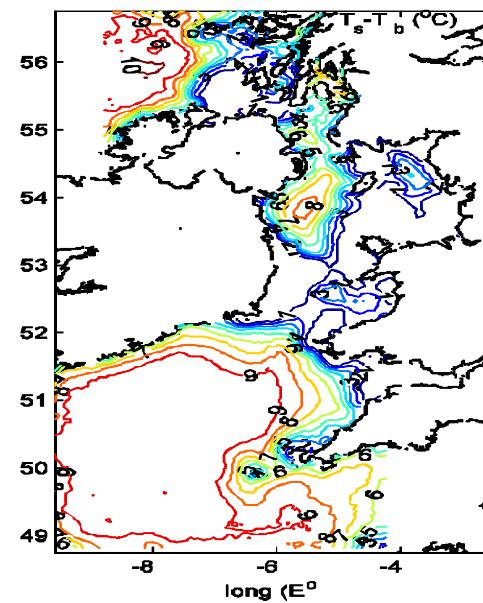
Surface temp (Ts)
Tb



Nearbed temp (Tb)



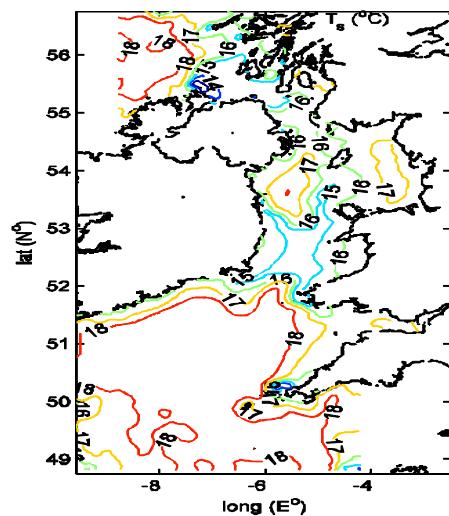
Ts-



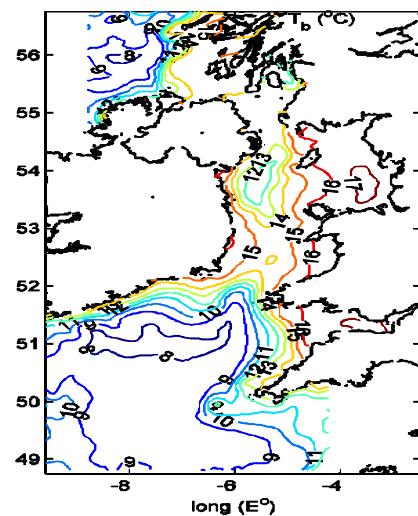
g0w9aq12-kh2b-sph, day= 97.5

Temperature at 16 Aug. 1995

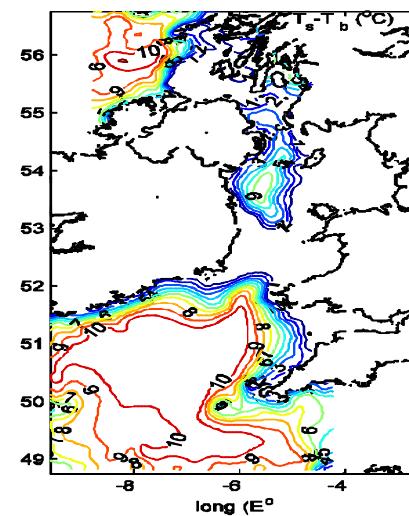
Surface temp (Ts)
Tb



Nearbed temp (Tb)



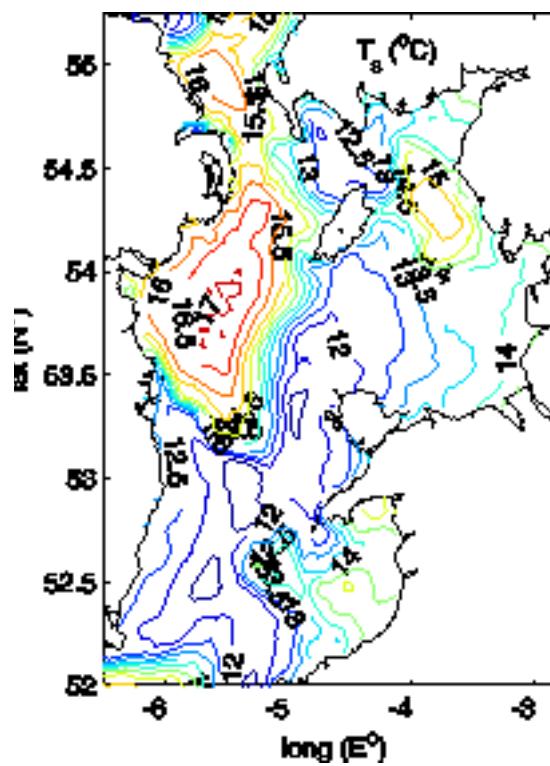
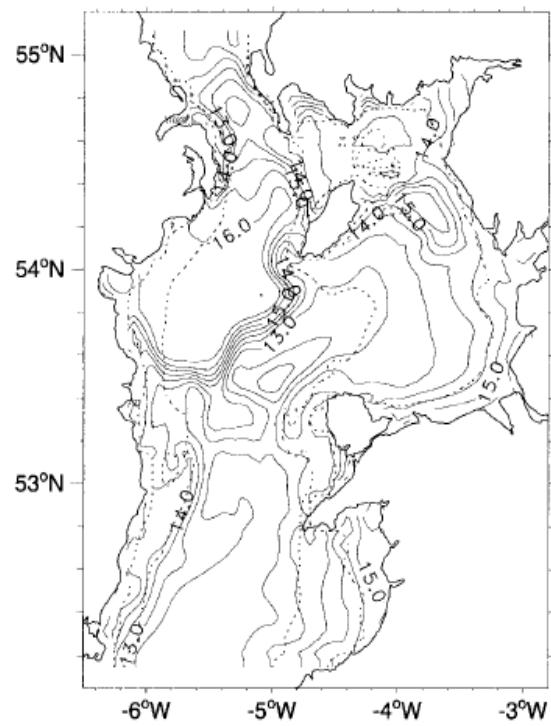
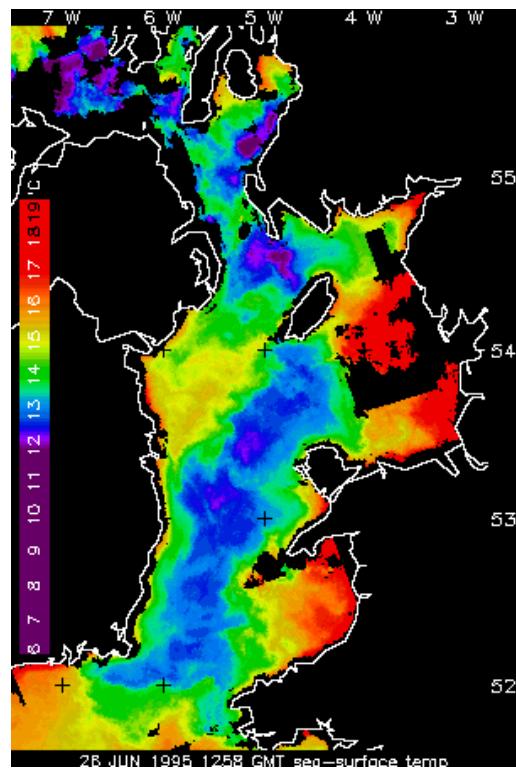
Ts-
Tb



g0w9aq12-kh2b-sph, day= 148

Surface temperature at 26 June 1995

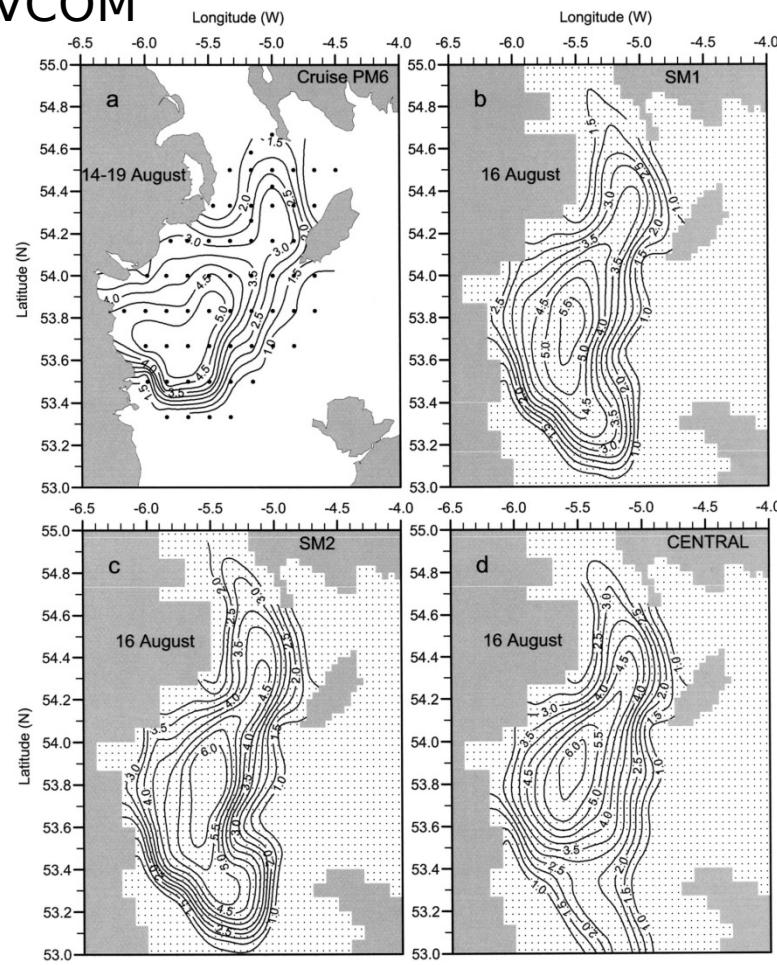
Xing + Davies JPO 2000



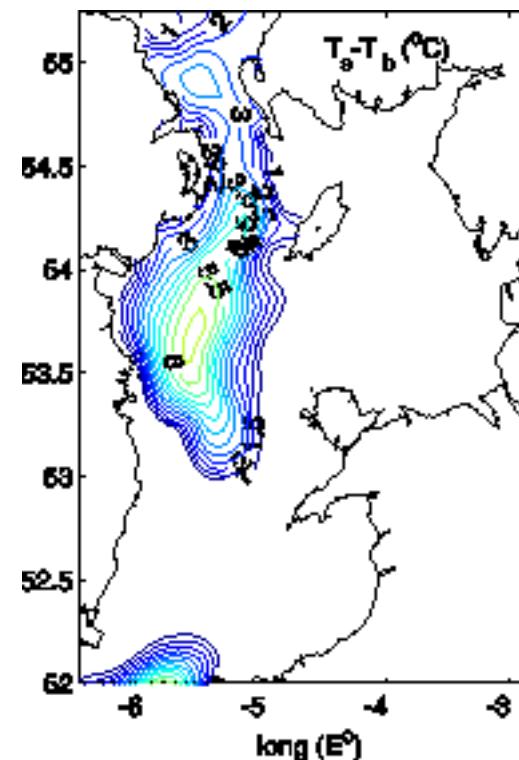
Spatial pattern of top-bottom temperature differences

OBS
FVCOM

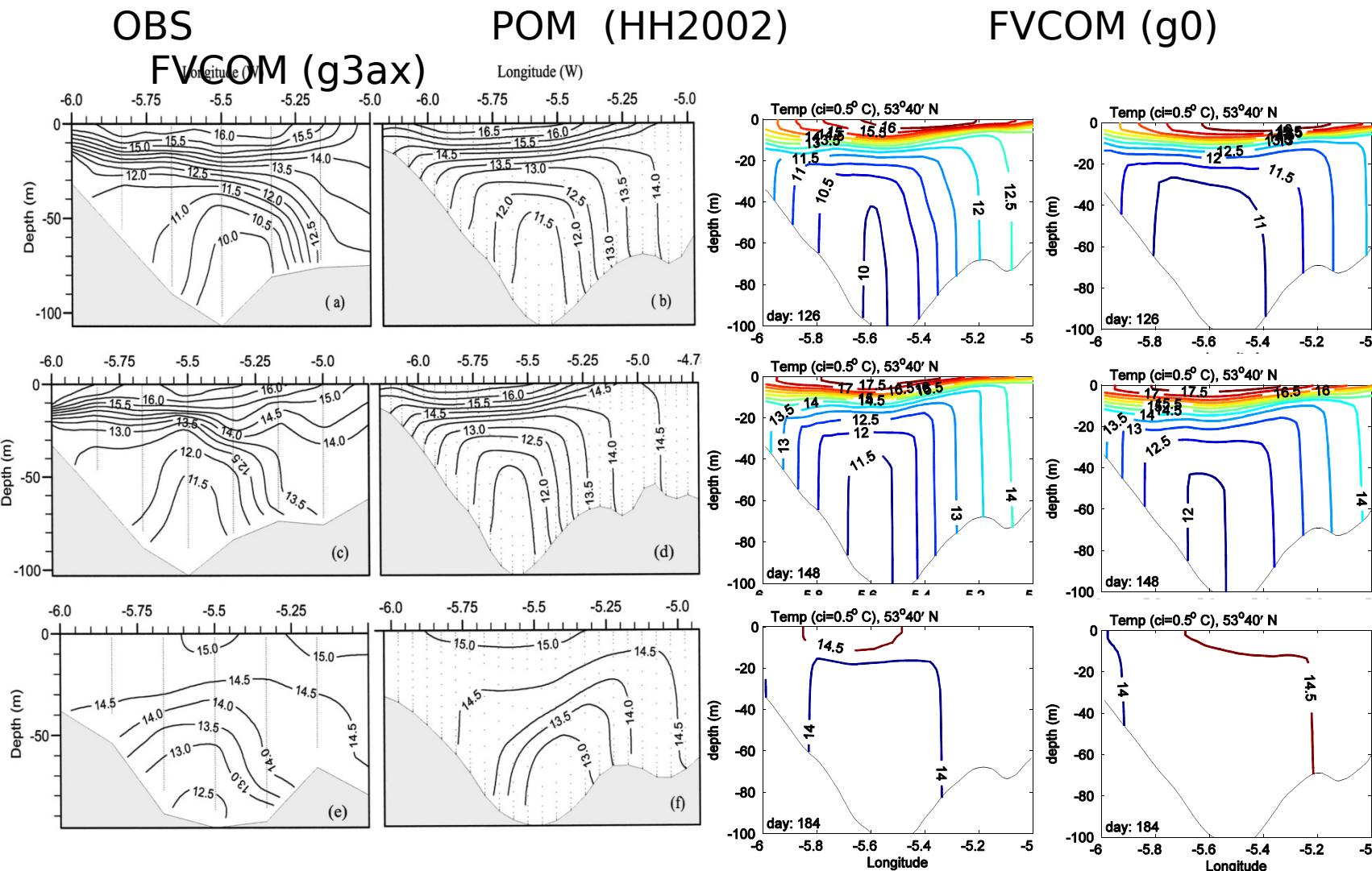
POM



16 Aug. 1995



(x-z) section of temperature along 53.67N from observations, models of POM and FVCOM

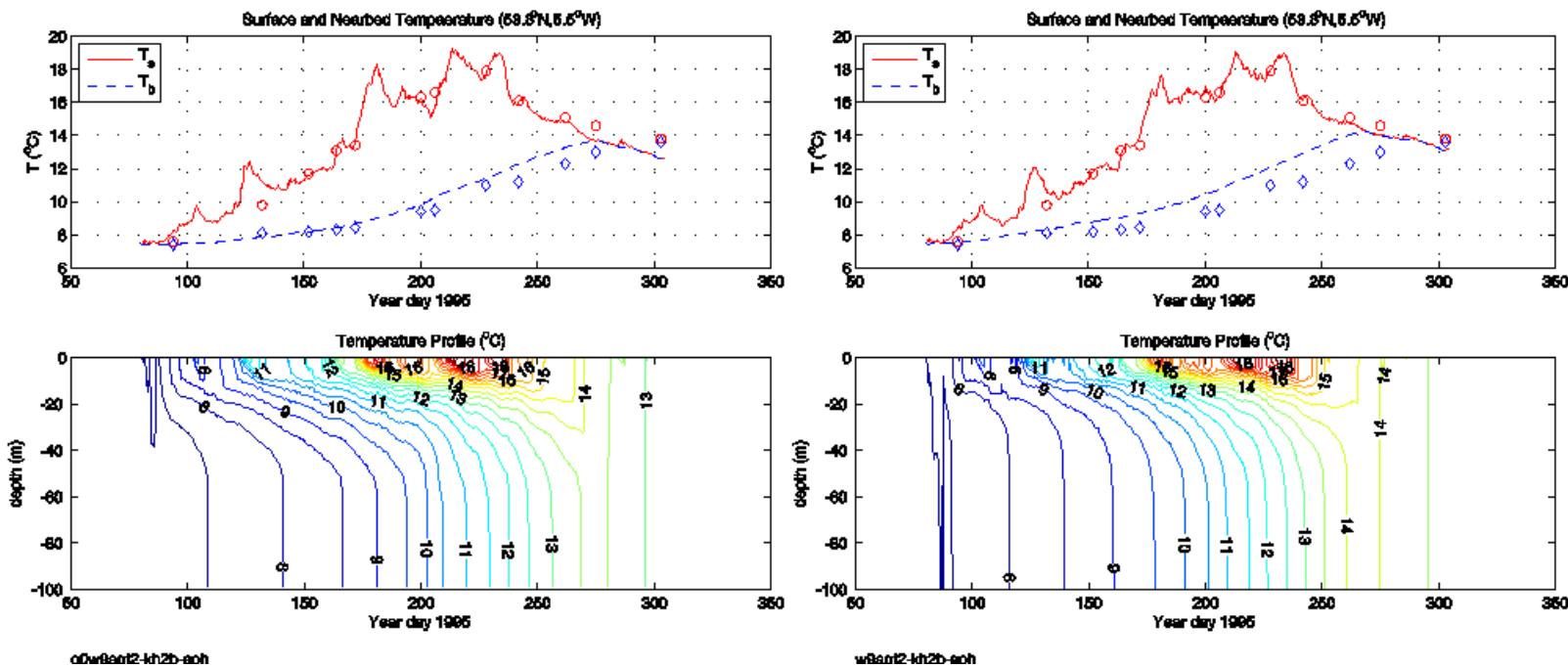


25 Jul.

6 Aug.

21 Sep.

Surface and nearbed temperature at a location of stratified western Irish Sea



Surface and nearbed temperature at a location in the stratified Western Irish Sea

