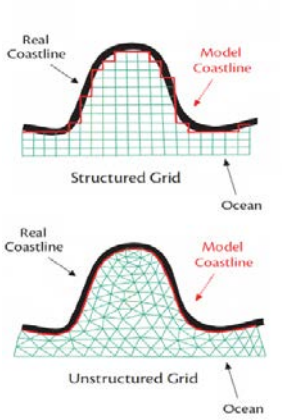
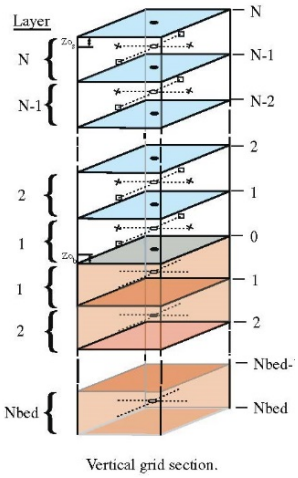
FVCOM – An unstructured grid Finite Volume Community Ocean Model

General features of hydrodynamic module:



- Solves primitive equations: momentum, continuity, temperature, salinity and density equations
- Turbulence submodels are included via coupling to the General Ocean Turbulence Model (GOTM).
- The horizontal grid is comprised of unstructured triangular cells, leading to better representation of irregular coastal geometry, albeit typically at increased computational cost.
- Irregular bottom is represented using generalized terrain-following coordinates
- Numerical scheme: second-order accurate discrete flux calculation in the integral form of the governing equations over an unstructured triangular grid.
- Wetting and drying scheme (thin film method)

Sediment transport: US Community Sediment Transport Model (Warner et al., 2008)



- Solves conservation of sediment mass for suspended sediment, for which erosion and settling rates are critical parameterisations
- Morphological evolution following Exner equation (bedload, erosion and deposition)
- Number of parameterisations and submodels (see Amoudry and Souza, 2011 for details)
    - Wave-current bed shear stress
    - Erosion rate
    - Deposition
    - Bedload transport rate

<u>Improvements to sediment transport model as part of BLUECoast:</u>
biological/ecological effect on erosion rate, roughness, settling rate (flocculation). A challenge will be to implement this without coupling to a biological/ecology (sub)model.

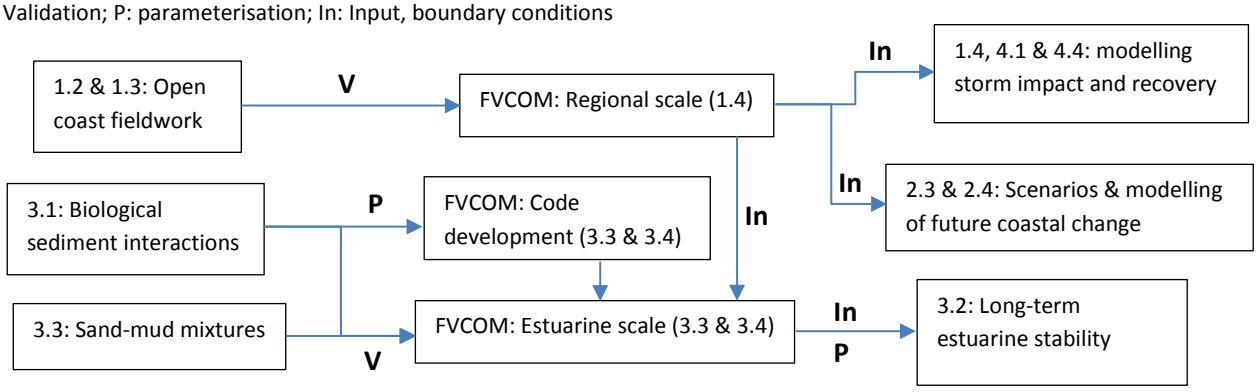
FVCOM has an offline particle tracking module for sediment pathways (to be improved if used).

FVCOM use and linkages in BLUEcoast

Overarching modelling framework underpinning other modelling efforts:

- Regional scale modelling: UK scale model domain (NW European shelf) down to ~100 m resolution near the coast, hydrodynamics coupled with SWAVE for regional scale transport, pathways and providing boundary conditions to other models.
- Estuarine scale modelling with focus on estuarine case studies (resolution down to ~10s m)
    - Estuarine sediment transport with bio-sediment interactions with full operational realistic forcing
    - Estuarine biogeomorphological modelling using input reduction and forcing schematisation

V: Validation; P: parameterisation; In: Input, boundary conditions



http://fvcom.smast.umassd.edu/fvcom/

Amoudry and Souza, 2011, Reviews of Geophysics, 49, RG2002, doi: 10.1029/2010RG000341
Warner et al., 2008, Computers and Geosciences, 34, 1284-1306