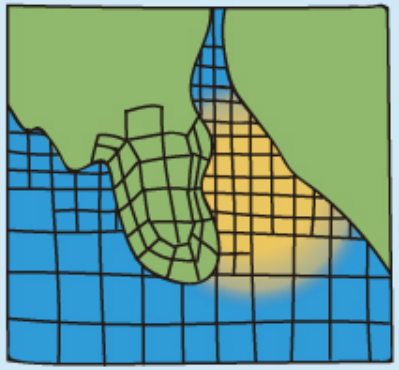

HAZRUNOFF

PROJECT

Integrated Water Cycle Modelling in Severn

MARETEC – Instituto Superior Técnico

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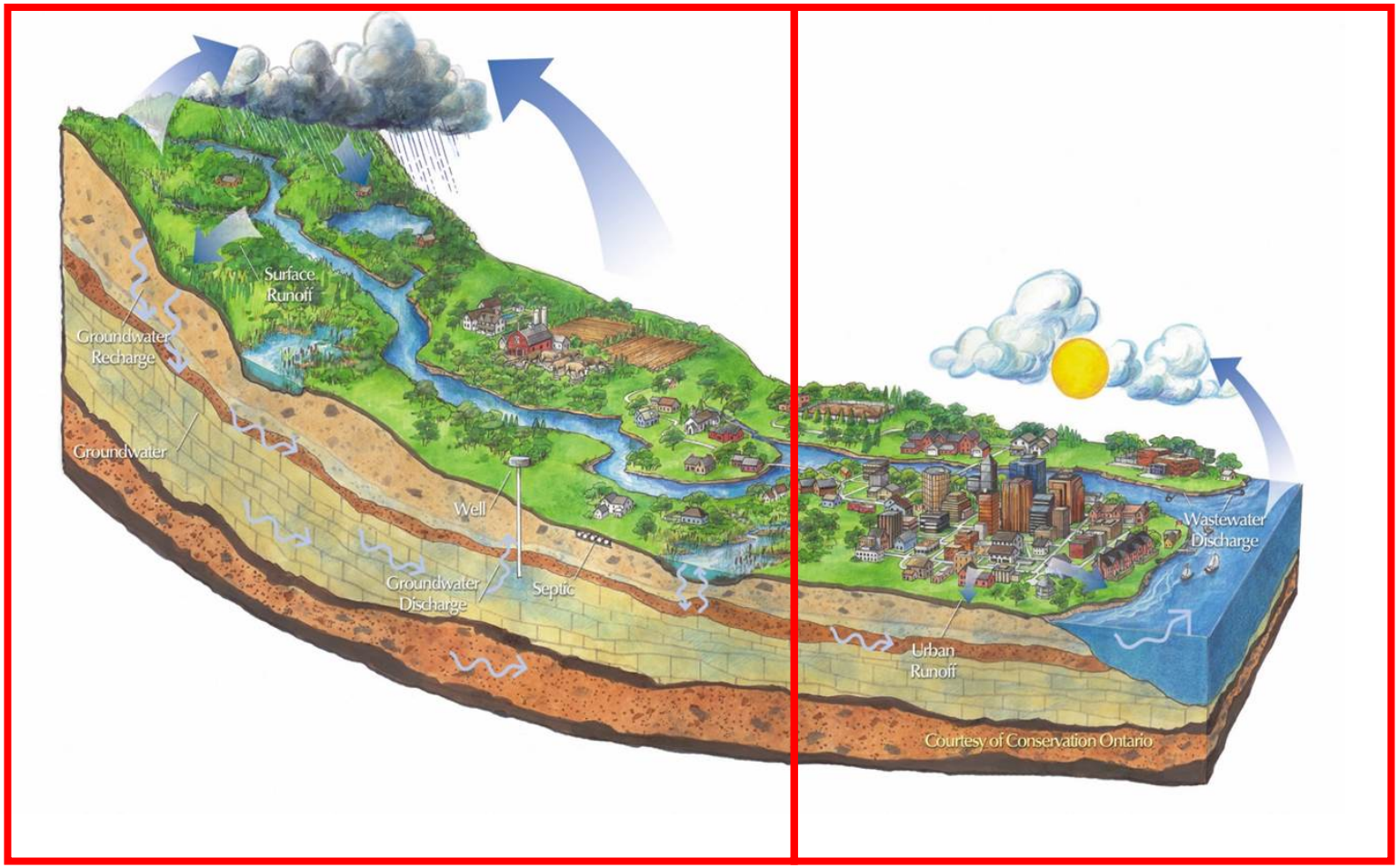
Watershed – Estuary – Coastal zone connection



Watershed modelling **Coastal modelling**

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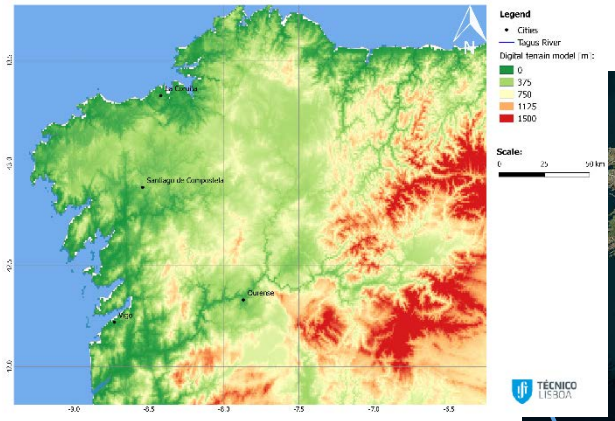
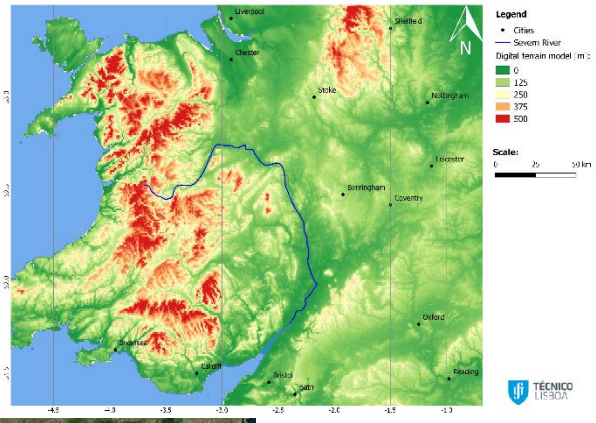
HazRunoff study areas

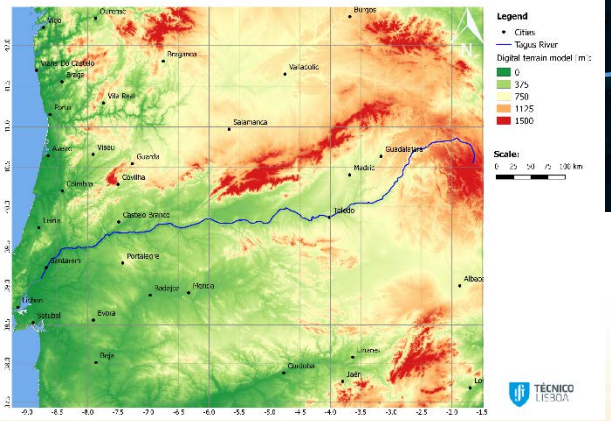
Ulla and Sar rivers \ Ria Arosa



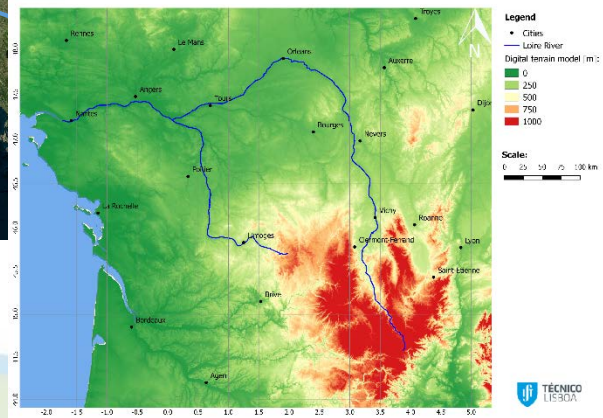
Severn river \ estuary



Tagus river \ estuary



Loire river \ estuary



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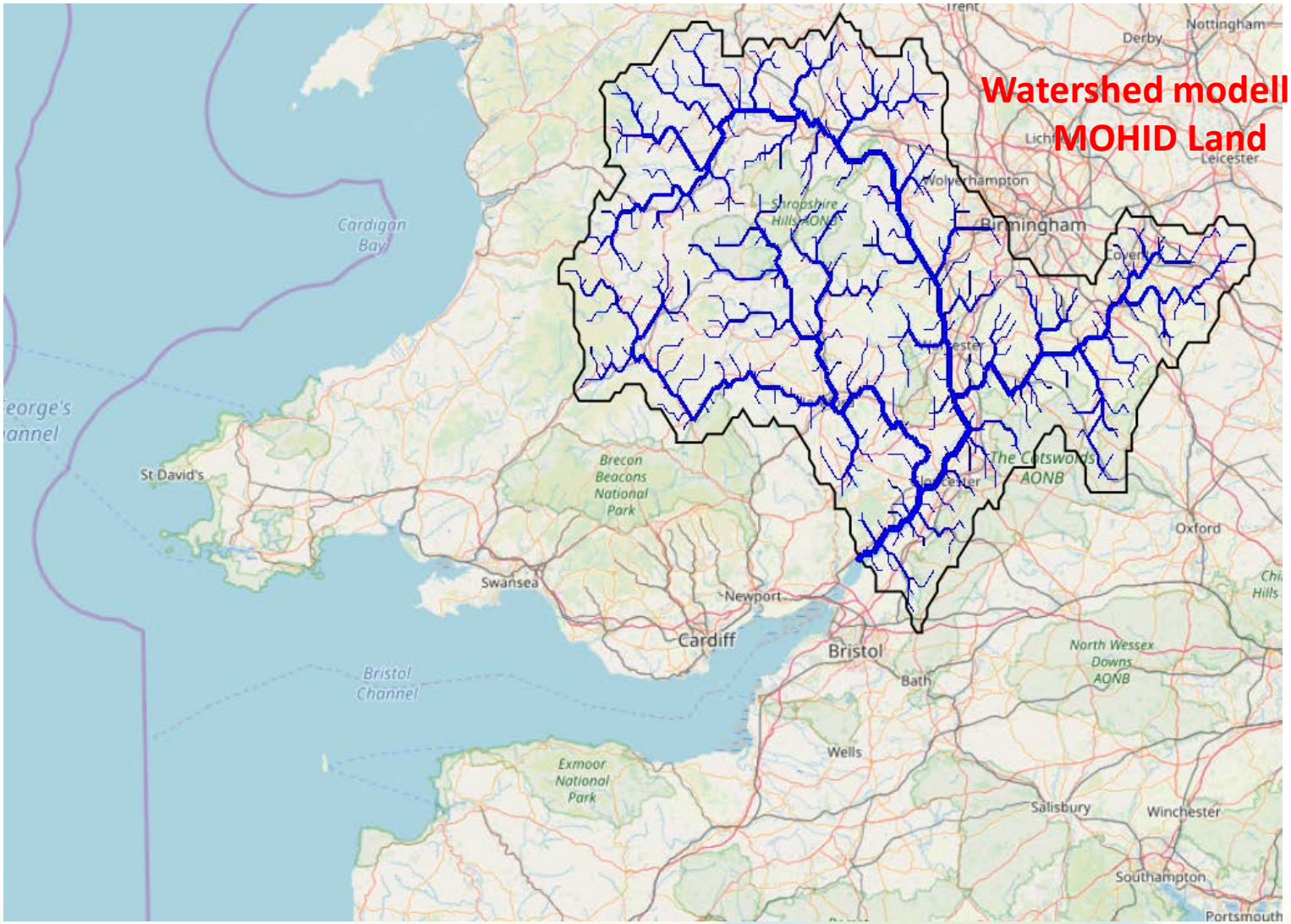
Watershed modelling in MOHID



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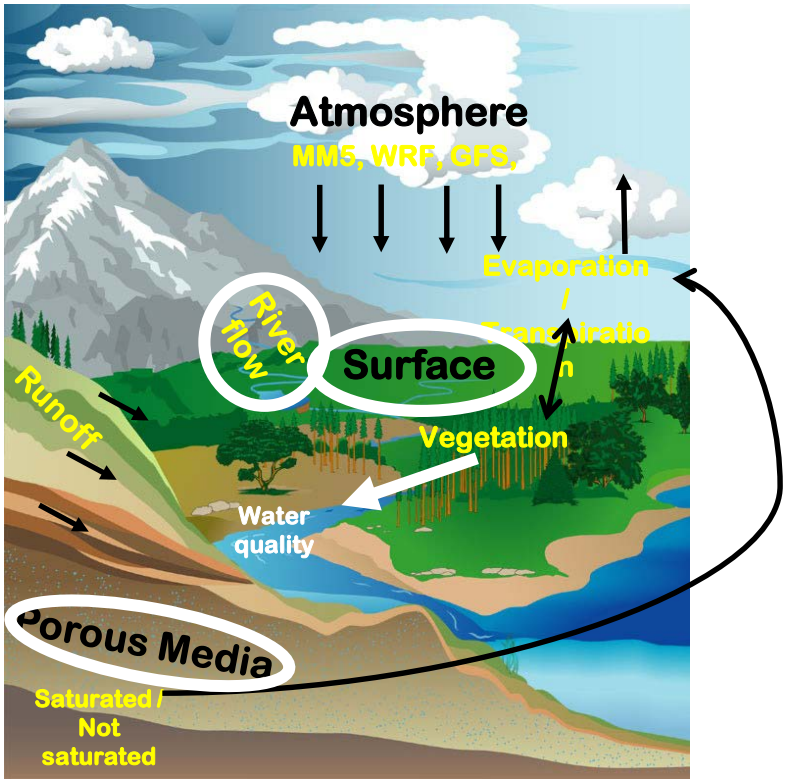
MOHID Land – Watershed Modelling

- According to a bidimensional regular grid and based on meteorological information, the precipitated water is estimated for each cell of that grid.
- The water deposited in each cell is distributed by the syrface, as runoff, by the porous media, as infiltration, and by the drainage network.
- The water fluxes between the porous media, the surface and the drainage network are calculated.
- The water extraction in the system occurs by evaporation and transpiration.
- Properties related to water quality are estimated in the porous media, in the surface and in the drainage network. The main input of nutrients comes from the vegetation.



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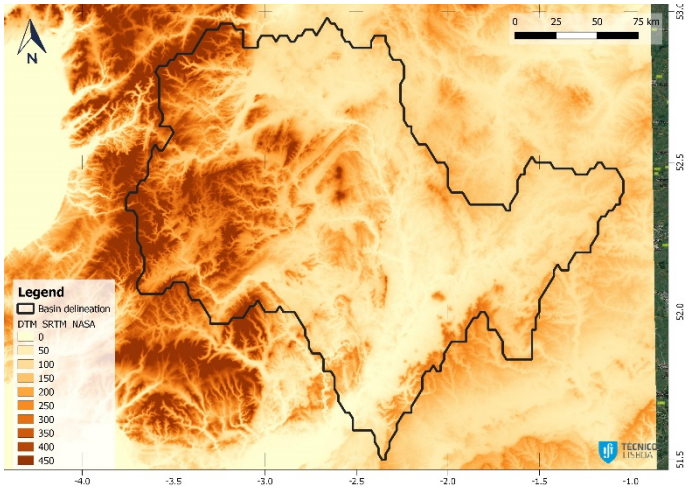
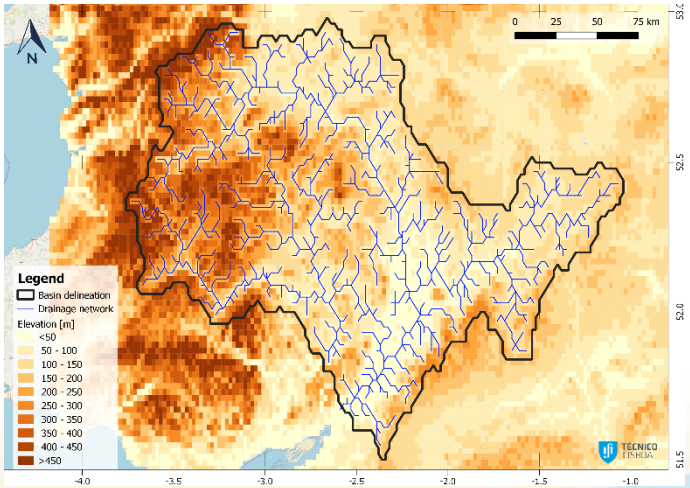
Severn

MOHID Land implementation





Digital Terrain Model
From: SRTM NASA
Resolution: 30m

Interpolation to MOHID grid
Resolution: 2 km

Delineation of watershed and drainage network

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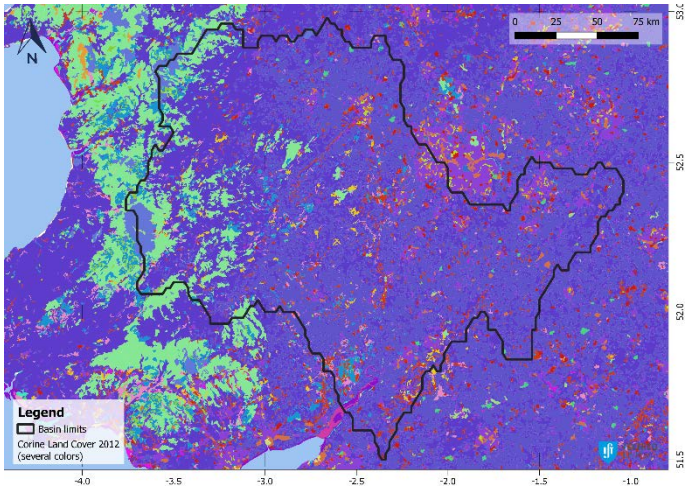
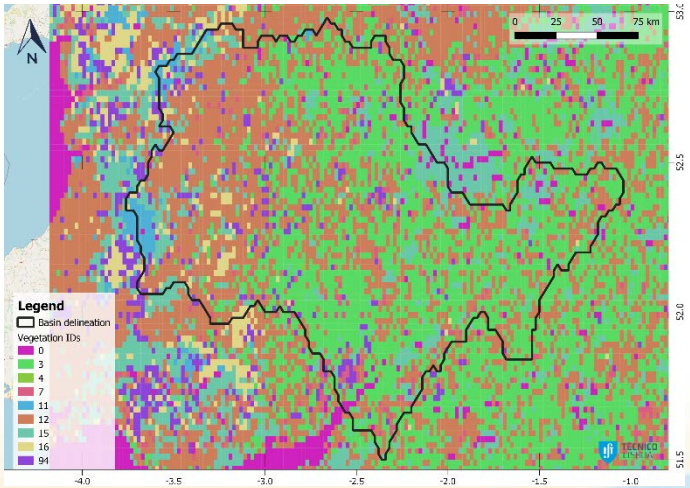
Severn

MOHID Land implementation





Land Use
From: Corine Land Cover 2012
Resolution: 100m

Identification of vegetation types

Interpolation to MOHID grid
Resolution: 2 km

Vegetation ID's

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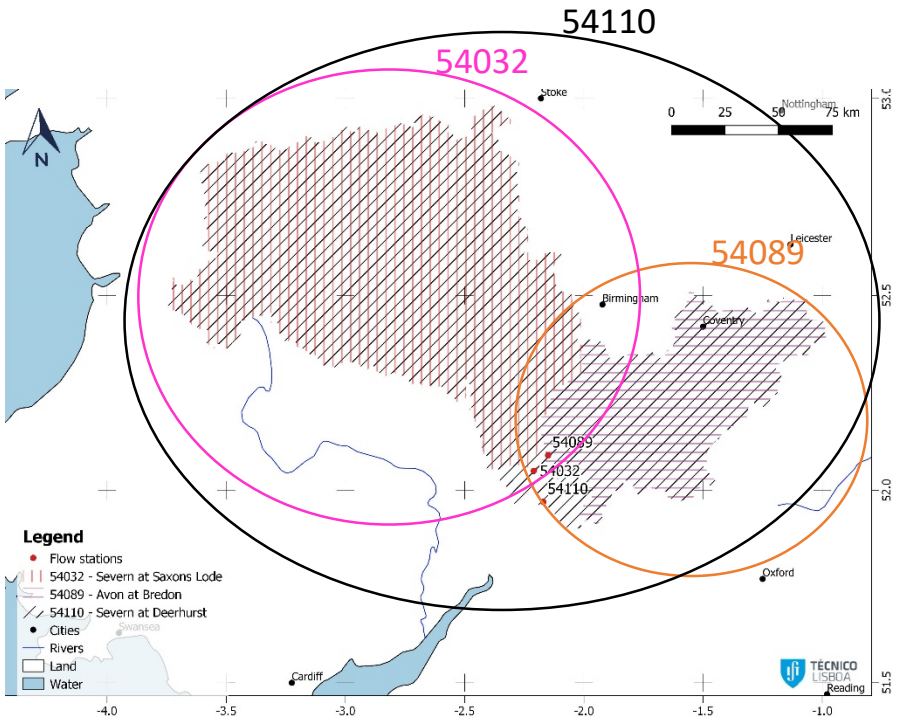
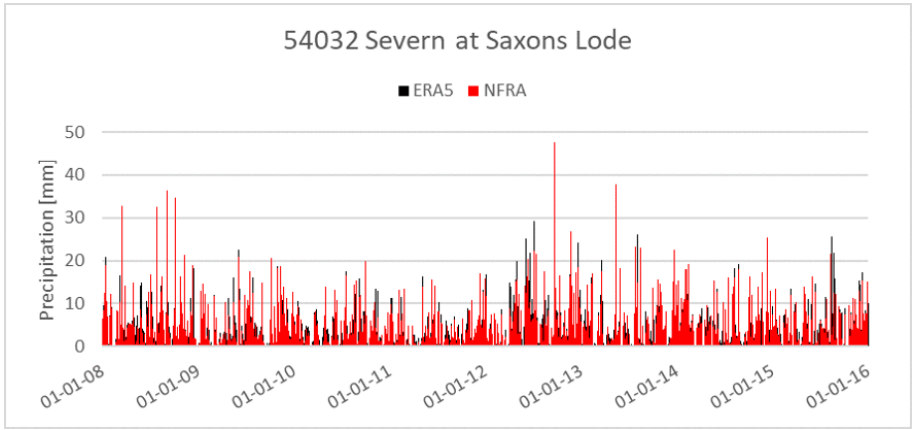
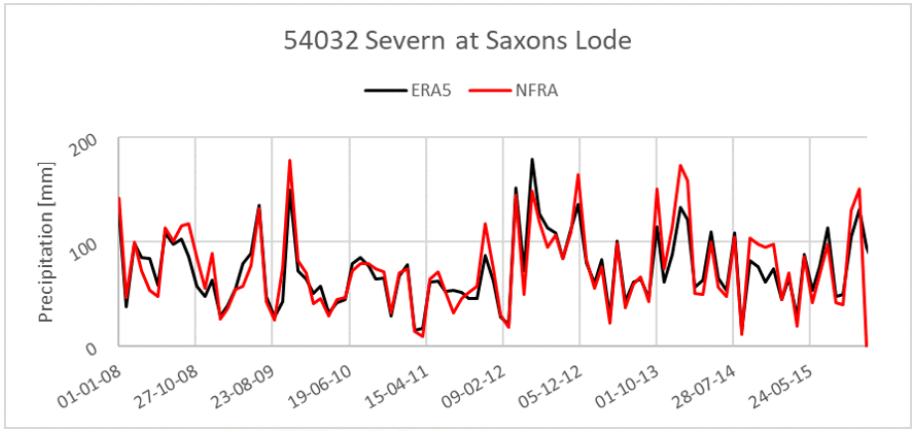
Meteorology validation







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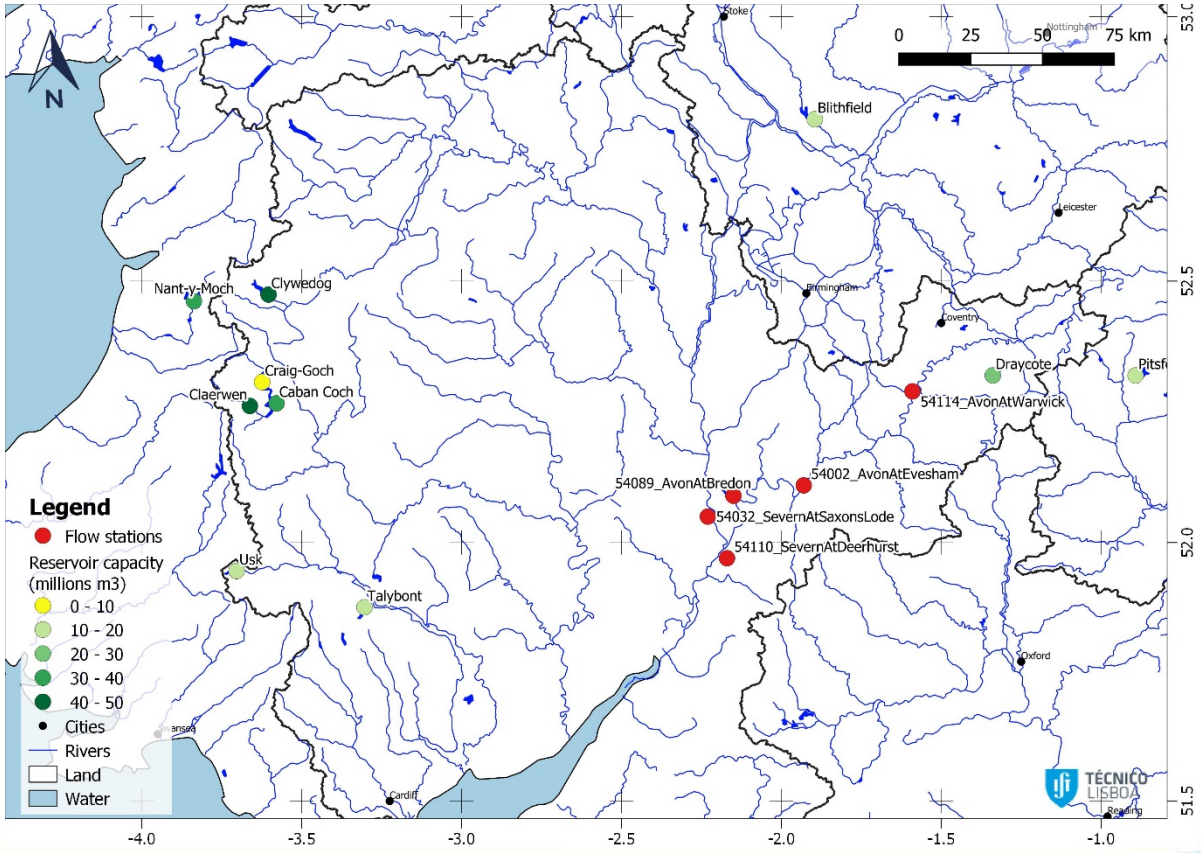
MOHID Land calibration



Flow stations	
Code	*Name*
54002	Avon at Evesham
54032	Severn at Saxons Lode
54089	Avon at Bredon
54110	Severn at Deerhurst
54114	Avon at Warwick

Reservoirs	
Name	*Capacity (millions m3)*
Caban Coch	35.5
Craig-Goch	9.2
Claerwen	48.3
Clywedog	50 ←
Draycote	22.7 ←
Usk	12.3
Talybont	11.7

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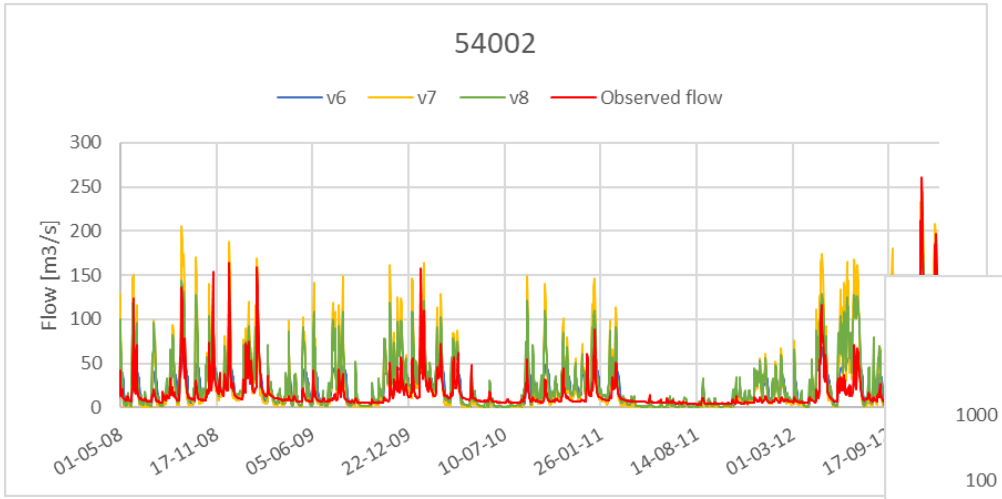
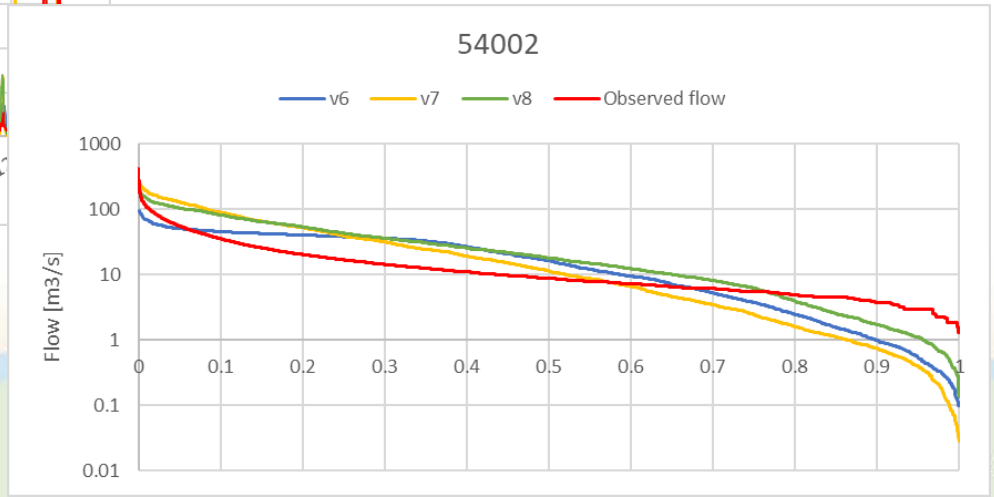
Severn

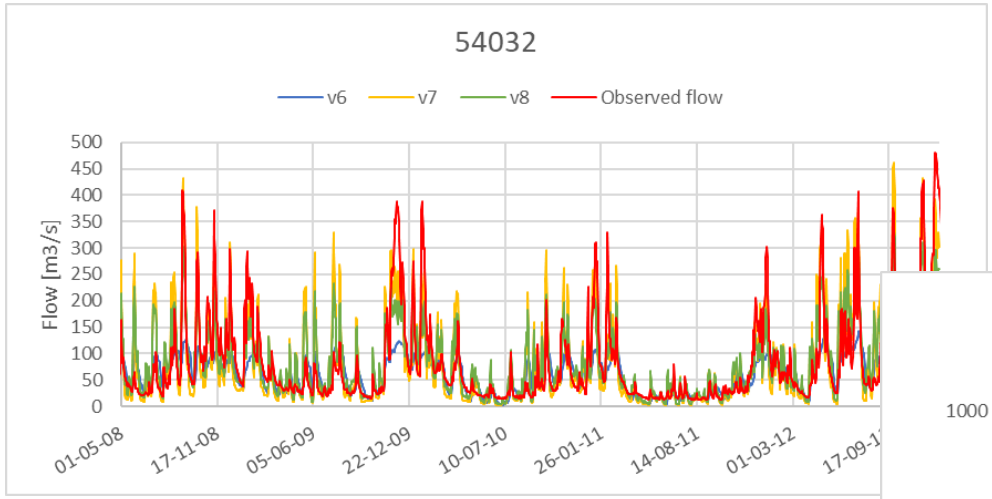
Station Avon at Evesham								
Statistical parameter	*Sim#1*	*Sim#2*	*Sim#3*	*Sim#4*	*Sim#5*	*Sim#6*	*Sim#7*	*Sim#8*
NSE	-	-	-	-0.79	-0.11	0.36	-0.46	-0.05
PBIAS	-	-	-	-42.07	-40.14	-11.84	-49.76	-52.97
R2	-	-	-	0.517	0.599	0.396	0.632	0.587
RMSE	-	-	-	31.12	25.54	19.86	28.60	23.70

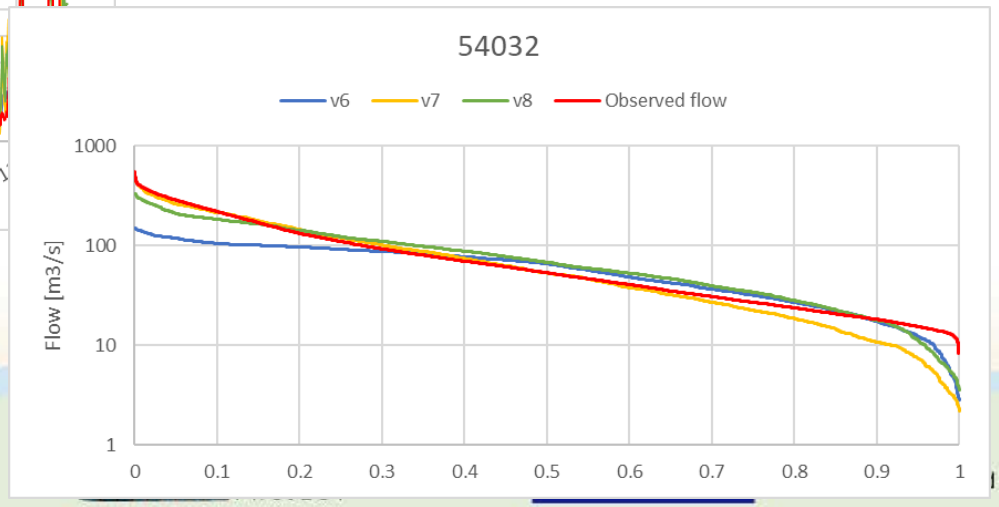




Severn

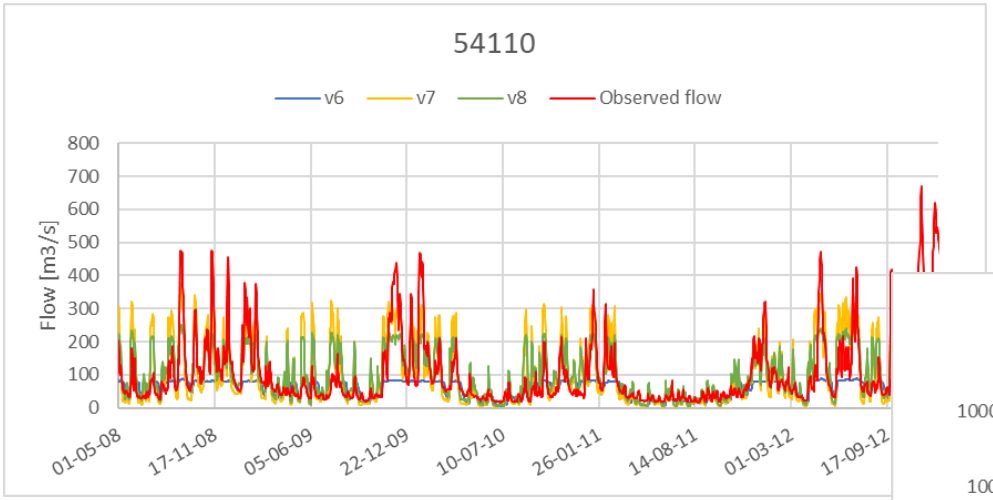
Station Severn at Saxons Lode								
Statistical parameter	*Sim#1*	*Sim#2*	*Sim#3*	*Sim#4*	*Sim#5*	*Sim#6*	*Sim#7*	*Sim#8*
NSE	0.46	0.53	0.54	0.56	0.62	0.36	0.63	0.66
PBIAS	-20.43	16.93	12.82	14.55	9.14	20.67	-0.24	-2.69
R2	0.558	0.552	0.589	0.581	0.625	0.498	0.663	0.657
RMSE	62.06	55.61	52.92	57.67	51.07	61.91	53.00	47.36

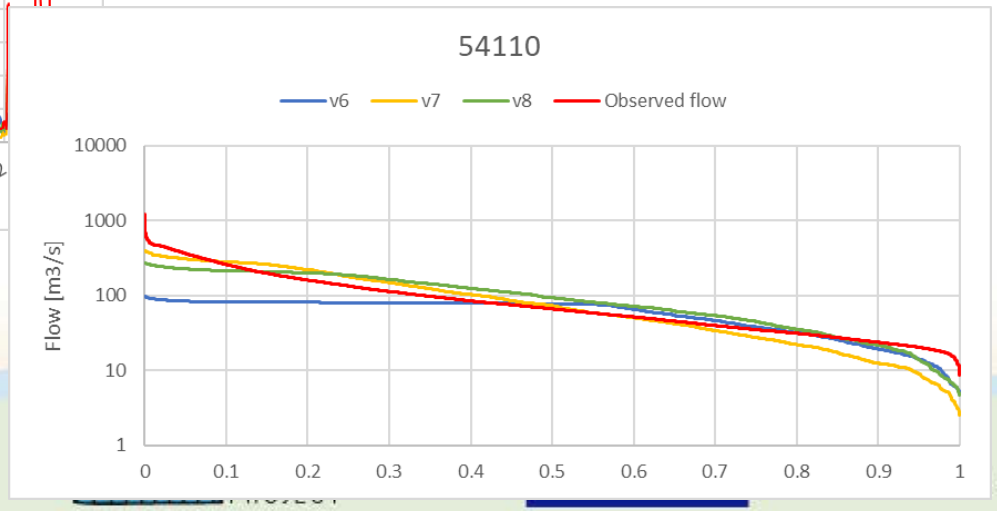




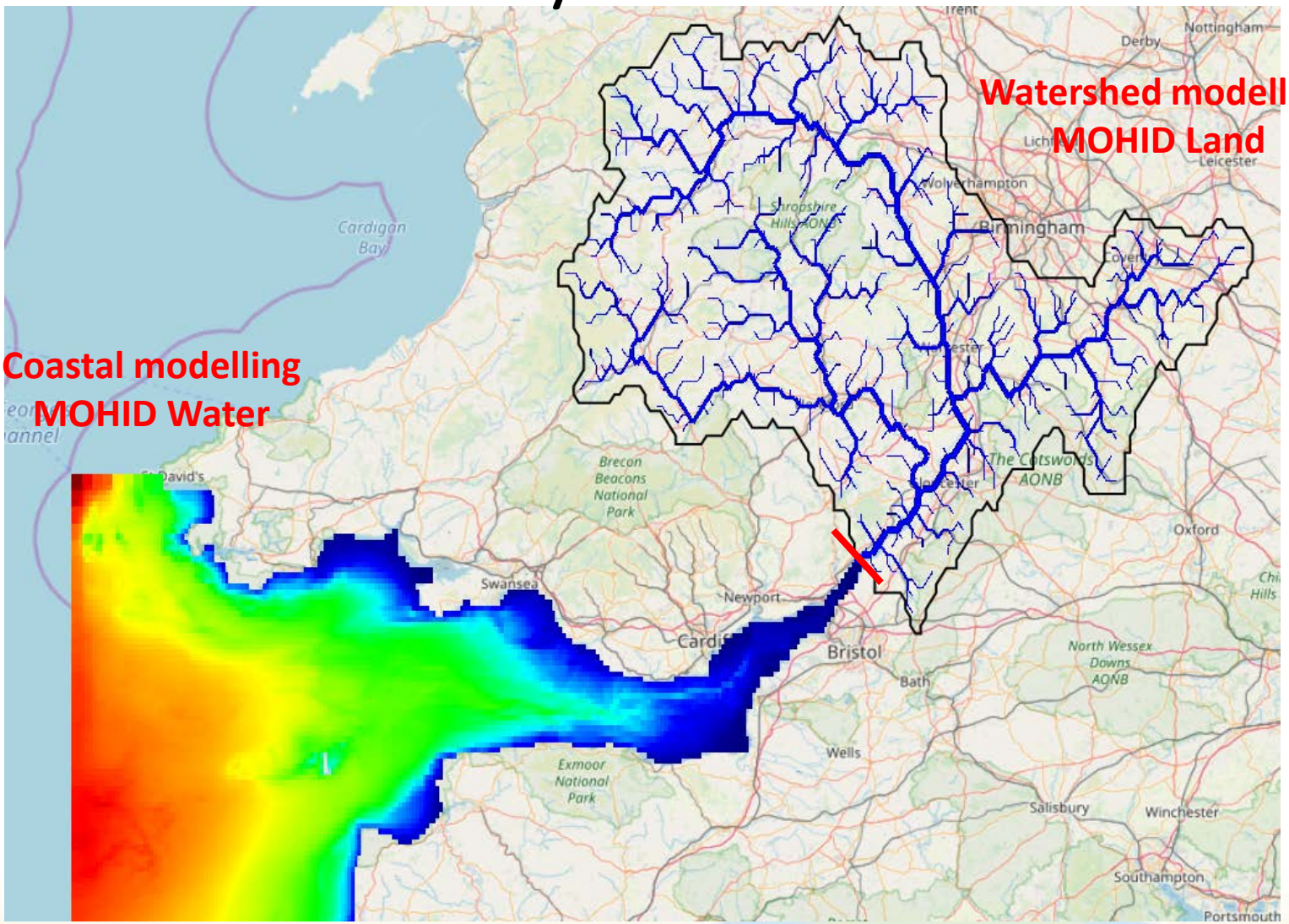
Severn

Station Severn at Deerhurst								
Statistical parameter	*Sim#1*	*Sim#2*	*Sim#3*	*Sim#4*	*Sim#5*	*Sim#6*	*Sim#7*	*Sim#8*
NSE	0.29	0.29	0.30	0.42	0.45	0.05	0.58	0.56
PBIAS	28.53	31.43	25.24	27.63	18.17	38.48	-4.40	-4.77
R2	0.389	0.409	0.422	0.464	0.486	0.305	0.616	0.559
RMSE	85.13	85.21	83.49	78.59	74.64	98.30	69.44	66.45





Watershed – Estuary connection in MOHID



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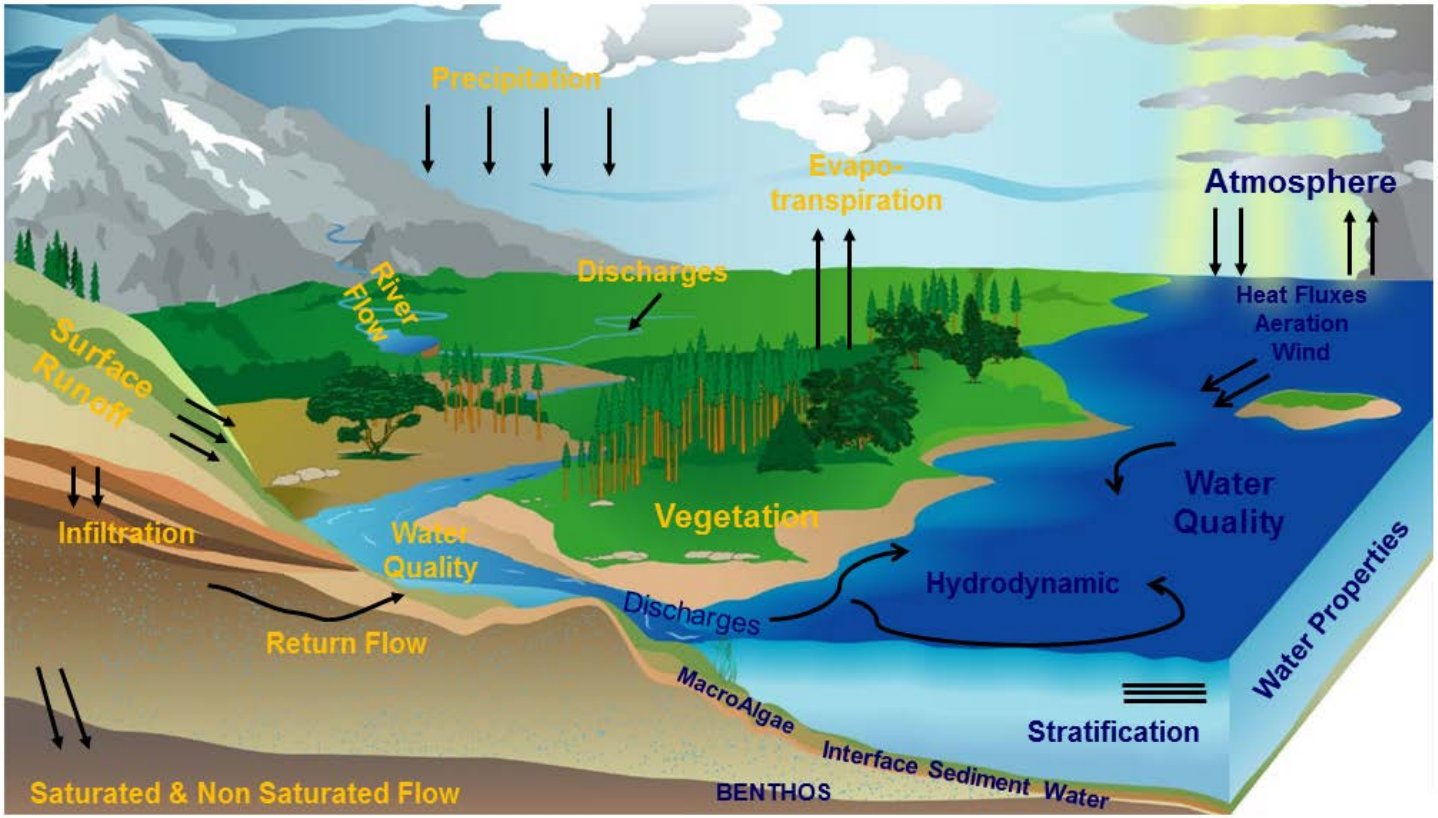
MOHID

Water Modelling System

Copyright by Maretec

Open-source community model

http://www.mohid.com



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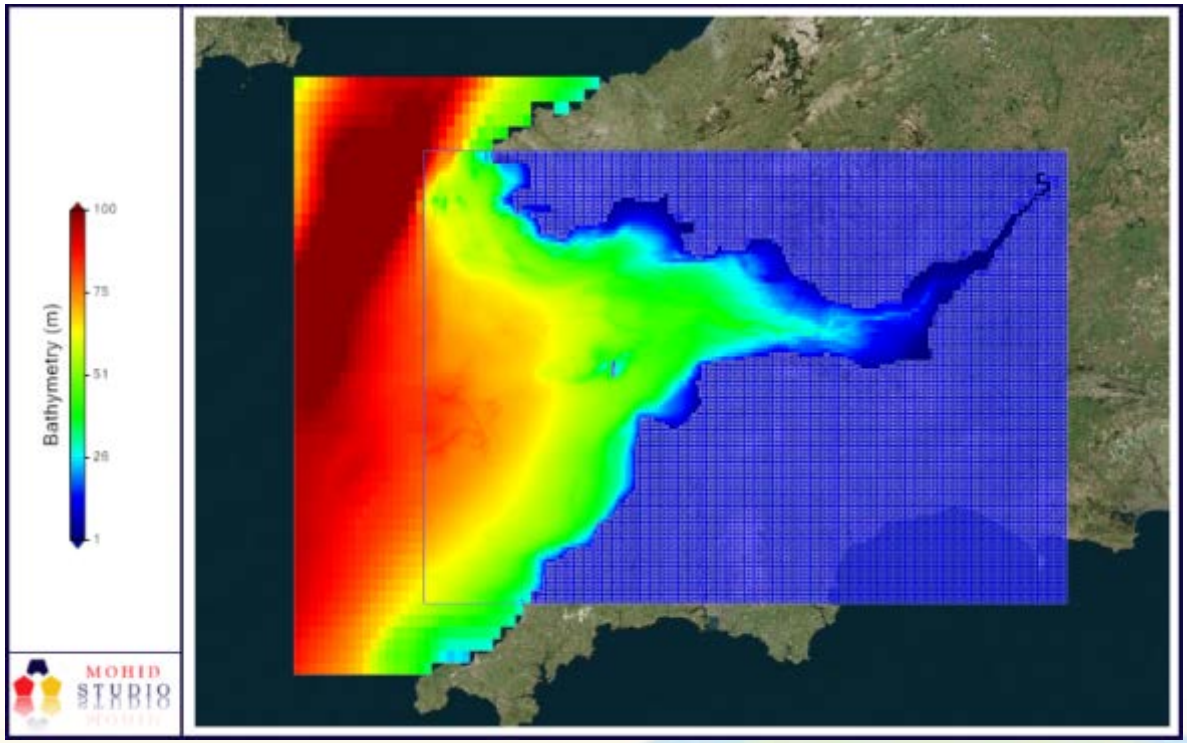
Severn estuary \ Bristol Channel

- 2 nested domain: 4km and 1km horizontal resolution
- 3D baroclinic model: 23 vertical levels
- Swansea area 250 m model resolution



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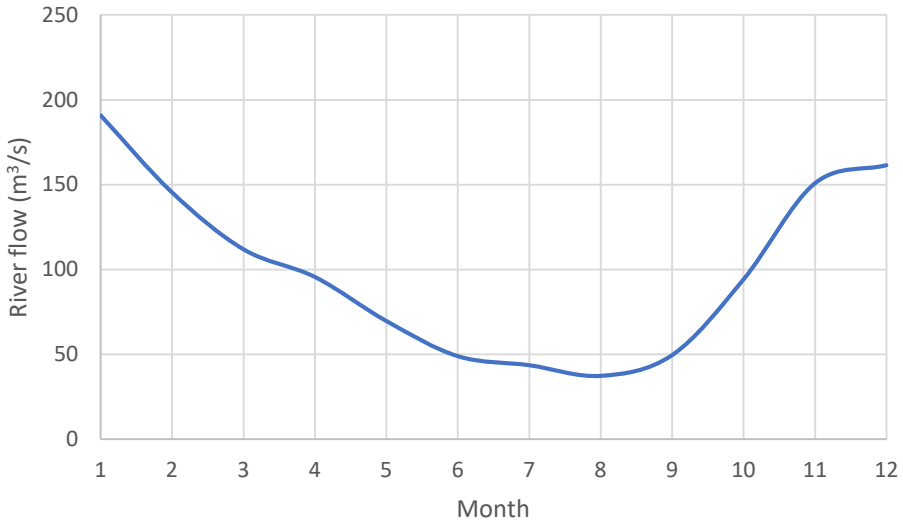
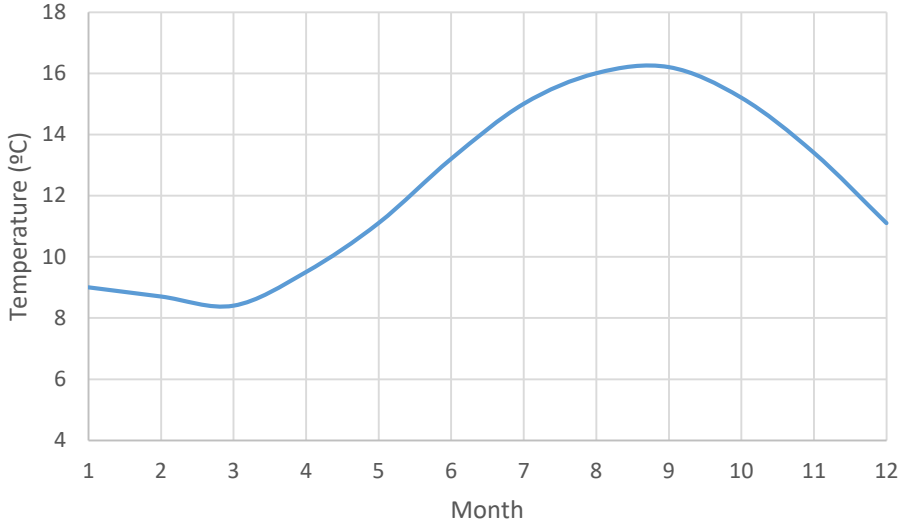
Bristol Channel \ Severn estuary

- Ocean boundary: Mercator Global ocean analysis (http://marine.copernicus.eu)
- Atmospheric boundary: GFS model 25 km; WRF model 9km-3km;
- River flow: monthly mean from Severn at Deerhurst station (16 years mean)
- River temperature: monthly mean (https://www.seatemperature.org/)





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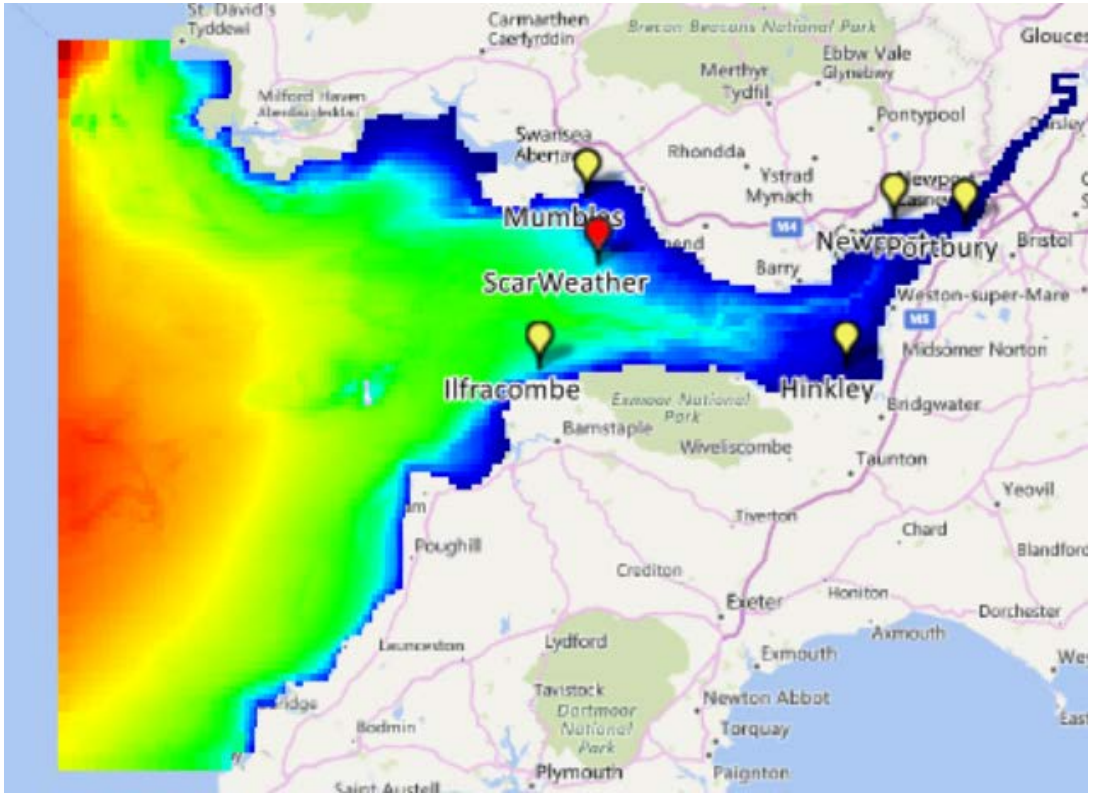
Bristol Channel / Severn estuary

- Water level: 5 stations
  EMODnet (www.emodnet.eu)

- Water Temperature: 1 station
  CEFAS (http://wavenet.cefas.co.uk)



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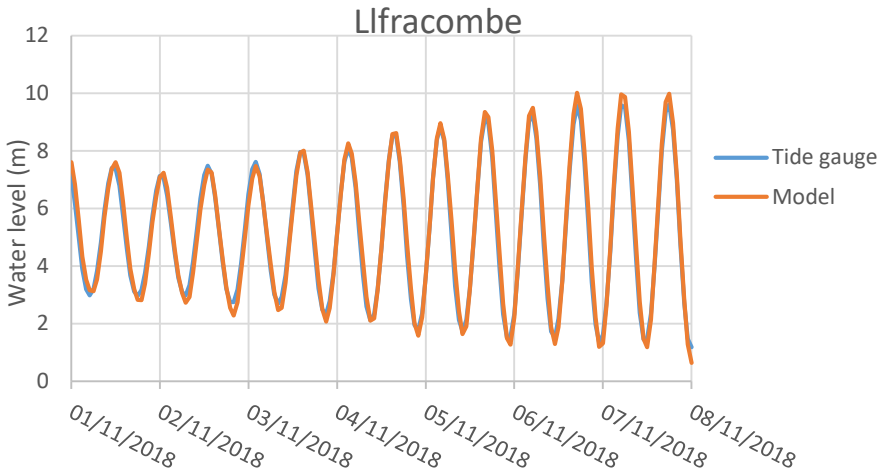
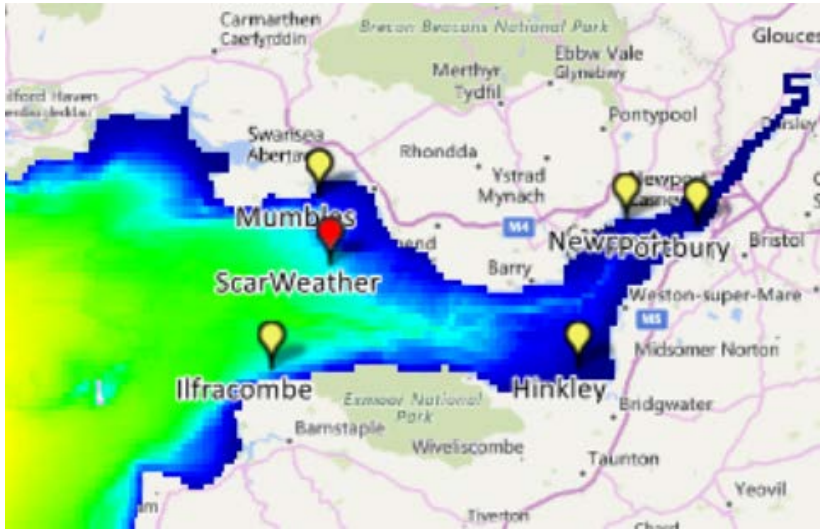
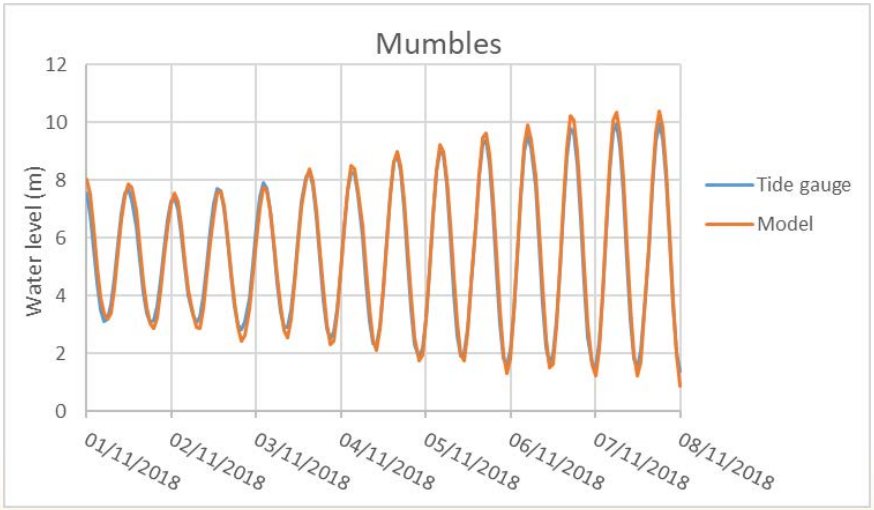
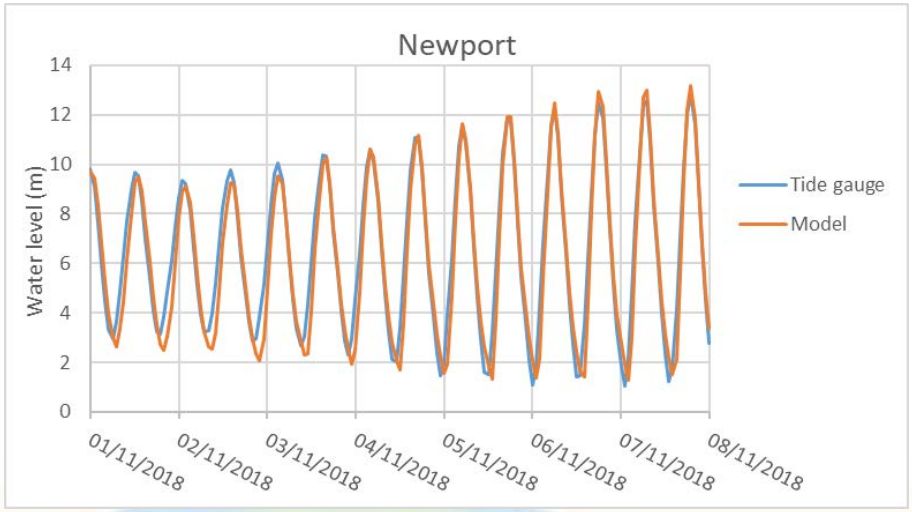
Severn estuary: water level









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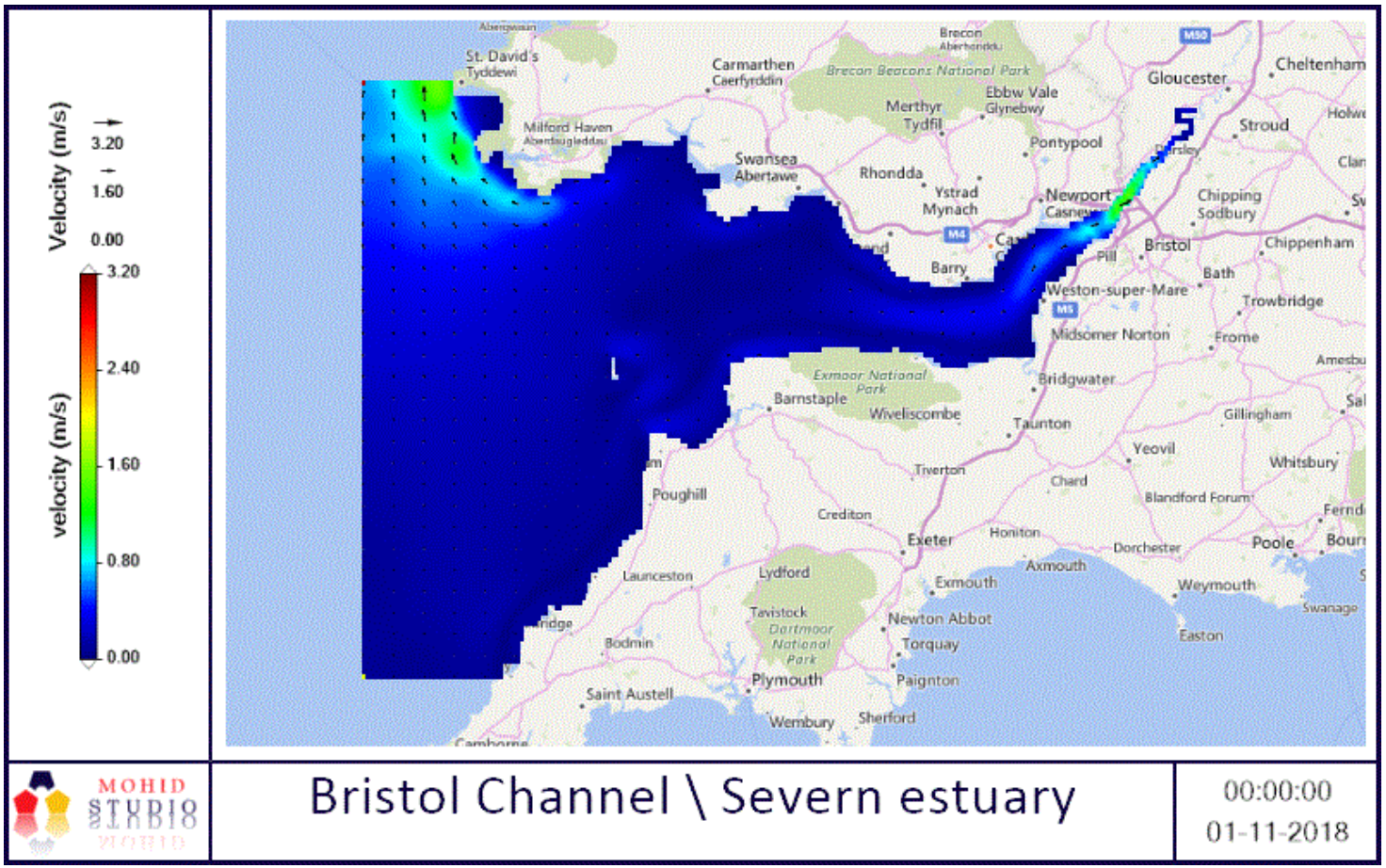
Bristol channel \ Severn estuary



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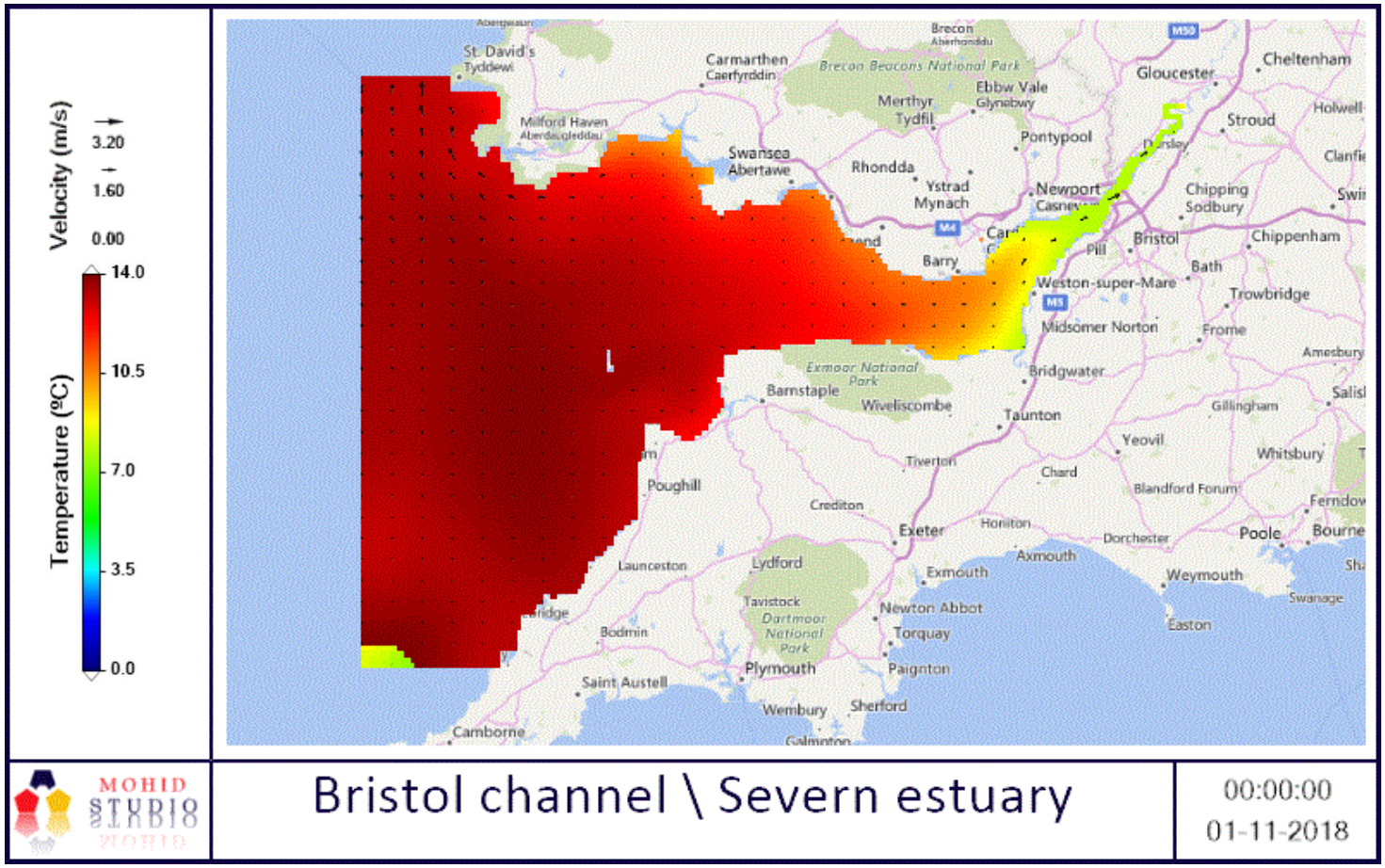
Bristol channel \ Severn estuary



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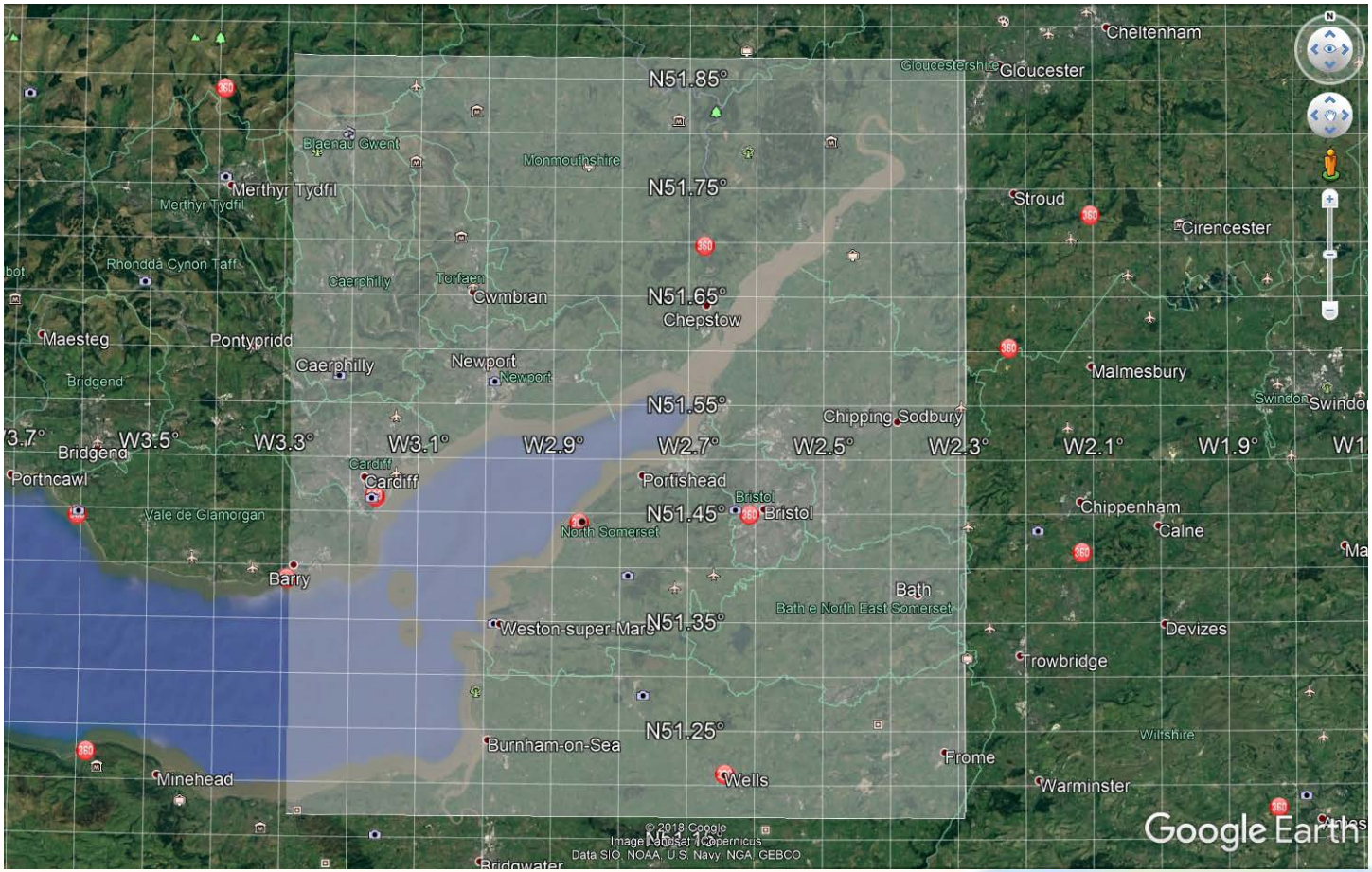
Meteorological modelling



WRF model:

9km: 43x45 cells (387x400km)

3km: 64x44 cells (190x130km)

1km: 70x78 cells (70x78km)

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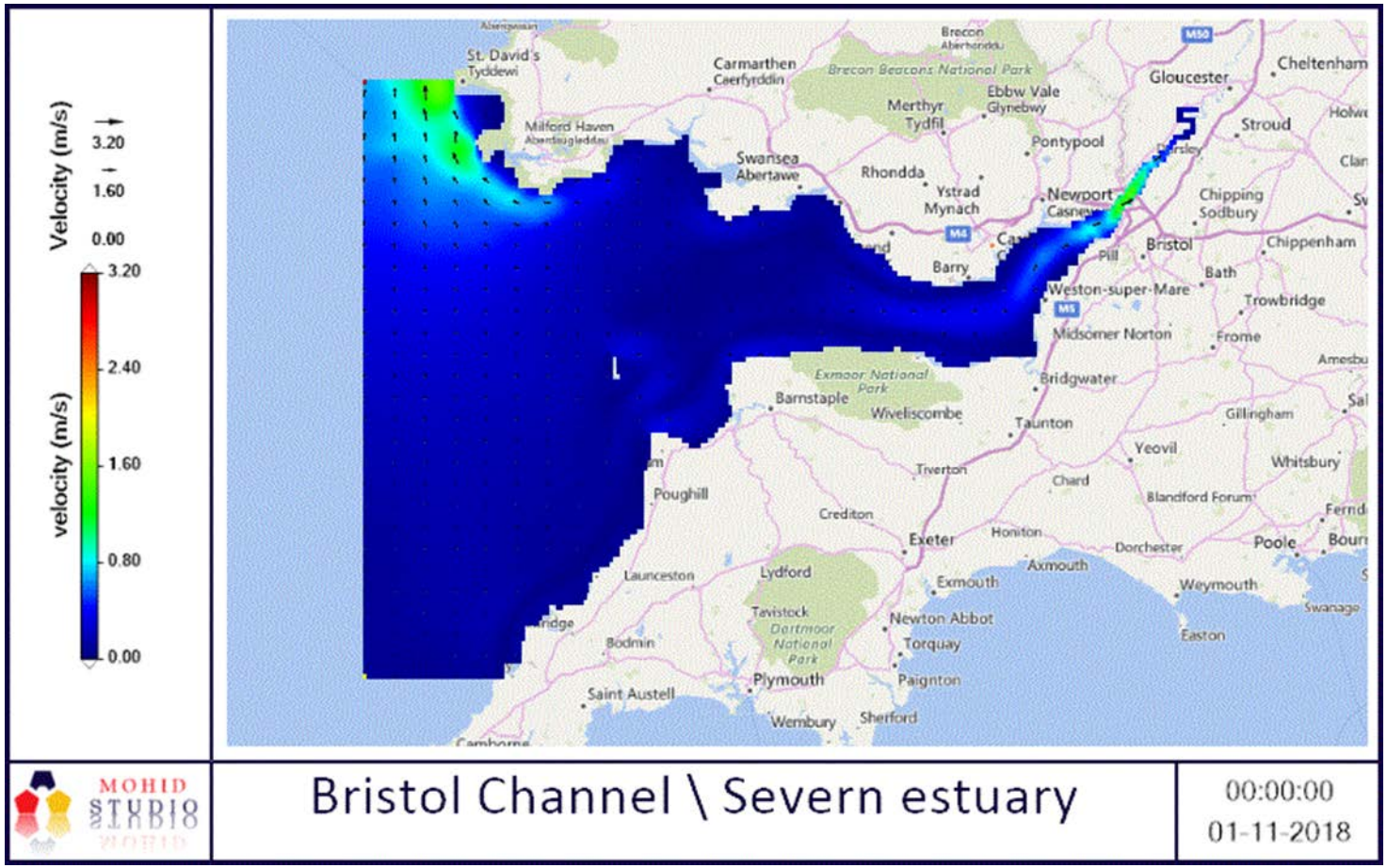

Obrigada
Thank you

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Obrigada

Thank you

Lígia Pinto
ligia.pinto@tecnico.ulisboa.pt

Ana Oliveira
anaramosoliveira@tecnico.ulisboa.pt

TÉCNICO LISBOA

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