

Coastal Risk in the Bristol Channel – a Meteorological Survey

On the Bristol Channel storms and storm surges have occurred throughout history, and have been the cause of substantial damage and flooding from the sea both in the past and more recently. These include events of the Little Ice Age, particularly severe damage in 1607 and between 1690 and 1720 (Lamb and Fryendahl 1991, Horsburgh and Horritt 2006). A number of more recent storm and storm surge events are shown in Fig1.

During the years 1981, 1984 and 1990 there were significant storm surges which caused substantial damage and flooding along the coast of Somerset and some coastal flooding over low lying areas of SE Wales, especially the event of 1990. Notable storms also occurred in 1996, 2008 and 2010, all of which caused damage along exposed coastlines of Somerset and some limited coastal damage and flooding in south Wales.

A good knowledge and understanding of the causes of such storms and surges is very helpful in assessing the associated risks that these events might present, both now and in the future. It can also inform the planning process.

KEY FINDINGS

- Similarities between 1981 surge and 2008 surge
- Importance of SE'ly winds in creating a bulge in water which travels up-channel as a significant surge
- Strong/gale force winds from the W'ly quadrant important in causing modest sea surface elevations and overtopping by wave action
- Importance of NE'ly winds in erosion and coastal risk to those areas exposed, particularly the s Wales coast near Penarth
- Importance of short timescale events

Burnham-on-Sea, Brean and Highbridge Flooding

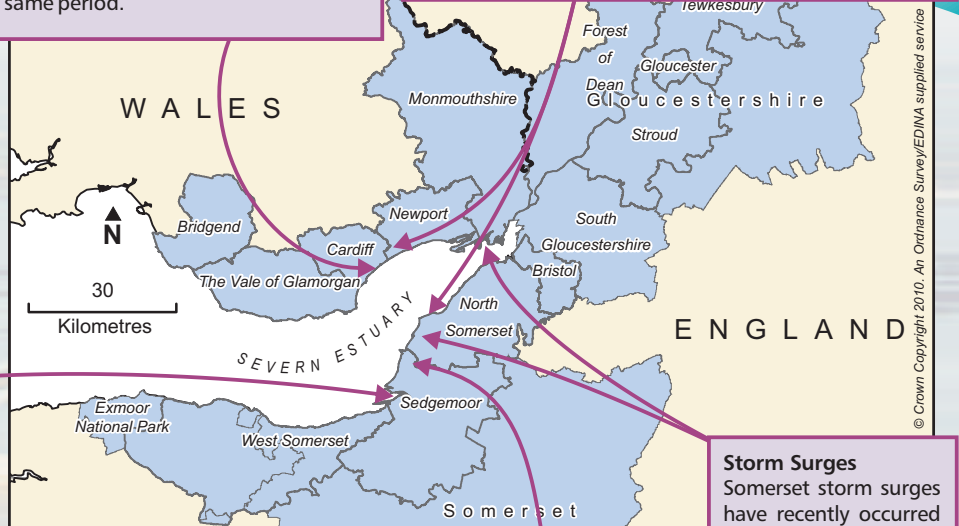
Burnham-on-Sea, Brean and Highbridge⁽¹⁵⁾ are all located on the Somerset coast north of the River Parrett estuary and are at risk from extreme tidal flooding events (from storm surges and extreme weather). The area has a history of flooding with significant events occurring in 1859, 1903, 1910, 1926 and 1981 when considerable damage was caused. There is a flood defence scheme present along the coast protecting these areas. The Environment Agency admits there remains a possibility that extreme severe flood events could overtop or breach the flood defences and flood the areas behind them. If this were to occur, several thousand properties may be affected. No defence can give absolute protection; it can only reduce the risk of flooding.

South Wales Severe Storms

Severe storms on the south Wales coast in March 2008 were reported⁽¹⁹⁾ and the media also reported damage along the Somerset coast during the same period.

North Somerset Coast and South East Wales

Severe flooding caused by a storm surge in 1607 has been reported as possibly the worst coastal flooding ever recorded for the Bristol Channel and Severn Estuary area⁽¹⁶⁾.



Somerset Coast Tidal Flooding

On 13th December 1981 a 1.45m tidal surge occurred close to the peak of a spring tide along the Somerset coast. Tidal defences breached across long lengths of Somerset's north and west facing coastline. Sea water flowed back to the M5 motorway, flooding communities and hundreds of hectares of open land.

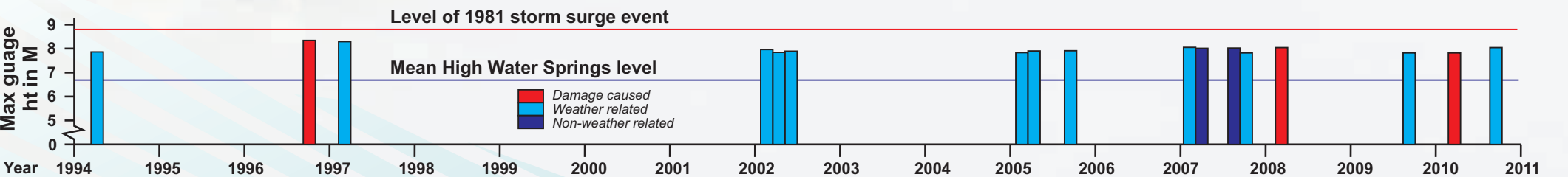
Storm Surges

Somerset storm surges have recently occurred in 1981, 1984 and 1990⁽¹⁷⁾, flooding Chepstow in 1981 and 1990, with tidal flooding also taking place in 1994, 1997 and 1999⁽¹⁸⁾.

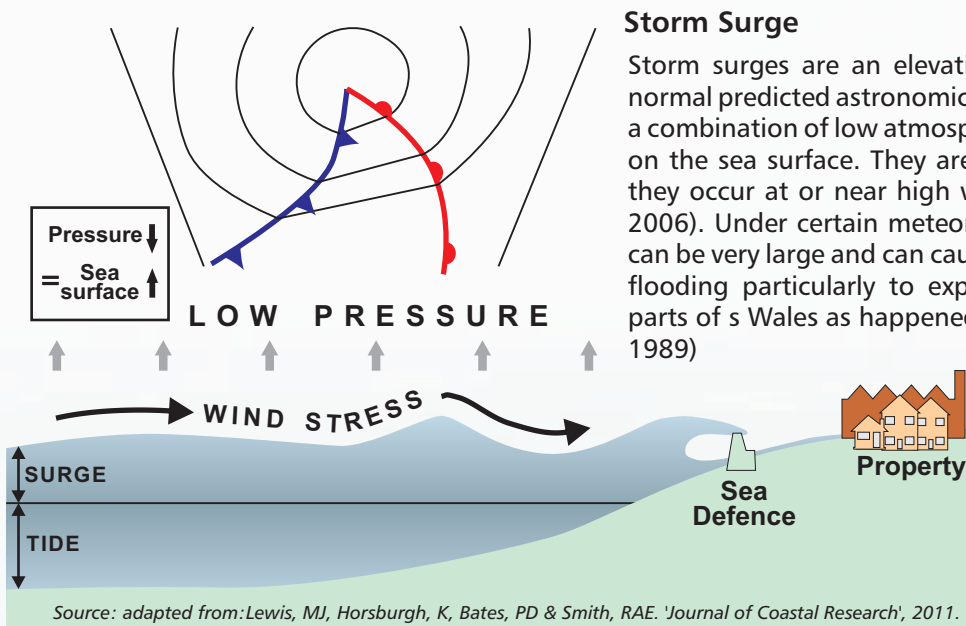
Examples of severe storm and tidal events affecting the Severn Estuary, adapted from Hovey et al. 2010.

High water events

This timeline shows the maximum elevation of water at the tide gauge at Avonmouth referenced to Ordinance Datum Newlyn put in date order. The bars indicated in Dark Blue are purely tide with little or no weather impact. The bars indicated in Red are events which have known to have caused coastal damage or overtopping. Data from BODC.



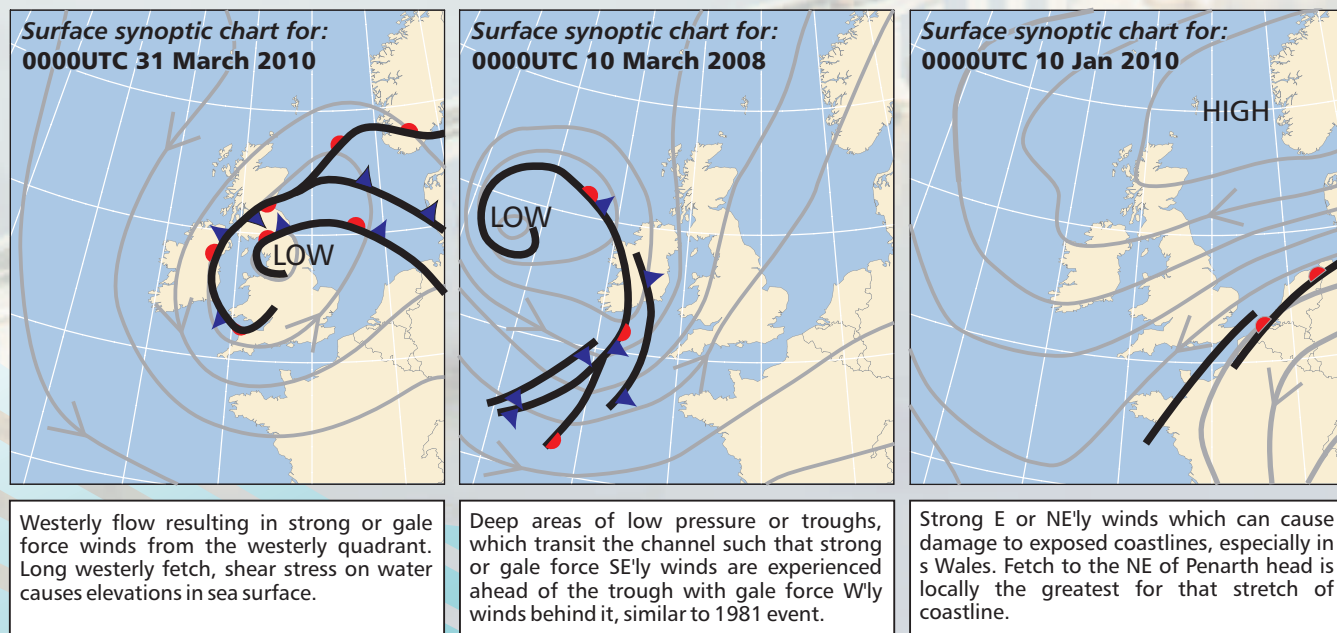
CLIMATE CHANGE ON THE SEVERN ESTUARY



The wind threat

All charts adapted from UK Met Office originals available at: (www.wetterzentrale.de/topkarten/tkfaxbraar.htm)

Three broad weather patterns have been identified which lead to coastal erosion/flooding and overtopping of sea defences.



References

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In addition to storm surges, the impact of more localised winds is also important to coastal risk on the estuary. An example of this is the impact of north-easterly winds on the coastline near Penarth Head in Wales. When the wind is from the north-east, this section of coastline is exposed to a large fetch in the same direction and significant coastal erosion has occurred (Phillips 2008). In addition, winds from the south-east cause erosion to the western side of Whitmore Bay, Barry.

Contacts and further information

Produced by N. Rodgers, Cardiff University Marine and Coastal Environment Research Group (MACE), as part of the IMCORE project (Innovative Management for Europe's Changing Coastal Resource).

For more information please visit: www.imcore.eu
Or contact: School of Earth & Ocean Sciences, Cardiff University,