

STORM EVENT

— 13th-14th December 1981 —

Severe coastal floods in Somerset



Severity Ranking



Social	<u>Loss of life</u>	*
	<u>Residential property</u>	1,072 properties (possibly inclusive of non-residential) were flooded, mainly in the Somerset region of the Bristol Channel. The number of properties flooded further southeast in Hampshire is unknown.
	<u>Evacuation & rescue</u>	55 persons evacuated from a hospital in Hayling Island
Economic	<u>Cost</u>	Defences along the Somerset coastline incurred £6m in damages (an estimated £23m in 2014 prices).
	<u>Ports</u>	*
	<u>Transport</u>	Flood water reached the M5 motorway, although the level of disruption is unclear
	<u>Energy</u>	Hinkley Nuclear Power station was partially shut down following flooding
	<u>Public services</u>	*
	<u>Water & wastewater</u>	*
	<u>Livestock</u>	24,500 heads of livestock were killed
	<u>Agricultural land</u>	Over 50 km ² of land was inundated
Environmental	<u>Coastal erosion</u>	*
	<u>Natural environment</u>	*
	<u>Cultural heritage</u>	*
	<u>Coastal defences</u>	11 km of defences along the Somerset coastline was damaged

**No known sources of information available*

Source

The storm developed over Nova Scotia, Canada on 9th December 1981 and moved east towards the UK. Early on 13th December, as the storm approached Ireland, it separated into two depressions, with the northern depression moving north and dissipating; while the secondary depression crossed southern Ireland and travelled into the Irish Sea. The secondary depression then moved over southern Wales and southern England and crossed the North Sea into Germany. As the secondary depression approached and crossed the UK, central pressures dropped to just above 960 mbar and there were strong westerly winds in the southern Celtic Sea in excess of 50 knots [25 m/s] (Proctor & Flather, 1989). Over the southern Irish Sea and central English Channel, south-easterly wind speeds of up to 60 knots [31 m/s] were recorded. The interaction between multiple cyclones and anti-cyclones present around 13th December enhanced the wind speeds of the relatively small secondary depression.

The storm generated a skew surge of over 2 m in the Bristol Channel and over 0.5 m and in parts of the Irish Sea. Water levels exceeded the 1 in 5 year return level at 3 sites in these regions. The highest return period water level was at Avonmouth and was 102 years; this is the highest return period event on record at that site.

Other than reported 20 ft. [6 m] high waves at Ryde (Isle of Wight, Hampshire), we are unaware of any sources describing the wave conditions during this event.

Pathway

Overtopping and damage affected 11 km of coastal defences and inundated over 50 km² of land in the southwest of England during this event, with further detail provided by Smith *et al.* (2012). As described below, there was overtopping and inundation in the Solent region.

Receptor & Consequence

This was a serious event with the worst impacts along the Somerset coast where 11 km of defences were damaged (Haigh *et al.*, 2015). Flood water reached the M5 motorway, impacted over 1,000 properties, killed 24,500 heads of livestock, and inundated over 50 km² of agricultural land inundated (Environment Agency, 2006; Met Office, 1981; Hovey & Rogers, 2010; FADS Directory, 2011; The Weston Mercury, 2012; Smith *et al.*, 2012; Williams *et al.*, 2012; Bristol Post, 2014). A particularly threatening impact was flood water entering the cooling water pump house of Hinkley nuclear power station, which subsequently shut-down for over 1 week (CEFAS, 2010). The damages to sea defences between Clevedon and Porlock totalled £6 m (estimated as £23 m in 2014 prices). In the Solent, the impacts were also serious albeit to a lesser extent, with many locations affected including Gosport and Eastoke (Portsmouth), Hayling Island, Langstone, Fareham, Ryde, Cowes, Freshwater, Yarmouth, and Southampton (Ruocco *et al.*, 2011). In some areas the conditions were described as the worst flooding in living memory. In Hayling Island, an emergency evacuation of 55 persons from a hospital took place as the nearby sea wall was threatened with being breached. A large area of the seafront at Eastoke was inundated, and "tonnes" of shingle was displaced in places making some roads impassable. Low-lying parts of Old Portsmouth were closed off as some areas flooded to a depth of 3 ft. [0.9 m], and residential properties were flooded in several locations, including Weston, Southampton where some families were forced to retreat upstairs. Some properties here flooded to depths of up to 4 ft. [1.2 m]. In Ryde, the hovercraft terminal was "wrecked" by waves, and "scores" of residential properties were flooded here also.

Table 1: High water levels (m CD) recorded at the UK National Tide Gauge sites that reached or exceeded a 1 in 5 year return level during the event.

Tide gauge Site	Date and time (GMT)	Return period (years)	Water level (m CD)	Astronomical tide (m CD)	Skew surge (m)
Newlyn	13/12/81 06:00	3	6.14	5.81	0.33
Avonmouth	13/12/81 21:00	102	15.43	13.35	2.08
Milford Haven	13/12/81 19:00	6	7.98	7.23	0.75
Fishguard	13/12/81 08:00	2	5.51	5.16	0.35
Holyhead	13/12/81 12:00	2	6.43	5.94	0.49
Heysham	13/12/81 12:00	<1	10.47	10.09	0.38
Portpatrick	13/12/81 13:00	8	4.82	4.13	0.69
Millport	13/12/81 13:00	2	4.37	3.69	0.68
Stornoway	14/12/81 09:00	<1	5.33	4.99	0.34
Ullapool	13/12/81 21:00	<1	5.7	5.38	0.31
Lerwick	14/12/81 13:00	<1	2.46	2.39	0.08
Wick	14/12/81 01:00	<1	3.97	3.6	0.37
Aberdeen	14/12/81 03:00	<1	4.8	4.5	0.3
Leith	14/12/81 04:00	<1	6.14	5.87	0.28
North Shields	14/12/81 05:00	<1	5.56	5.3	0.26
Whitby	14/12/81 18:00	<1	5.95	5.7	0.25
Immingham	14/12/81 20:00	<1	7.82	7.37	0.45
Lowestoft	15/12/81 00:00	<1	3.02	2.61	0.4
Sheerness	15/12/81 03:00	<1	6.37	5.81	0.55
Dover	15/12/81 01:00	<1	7.17	6.74	0.43

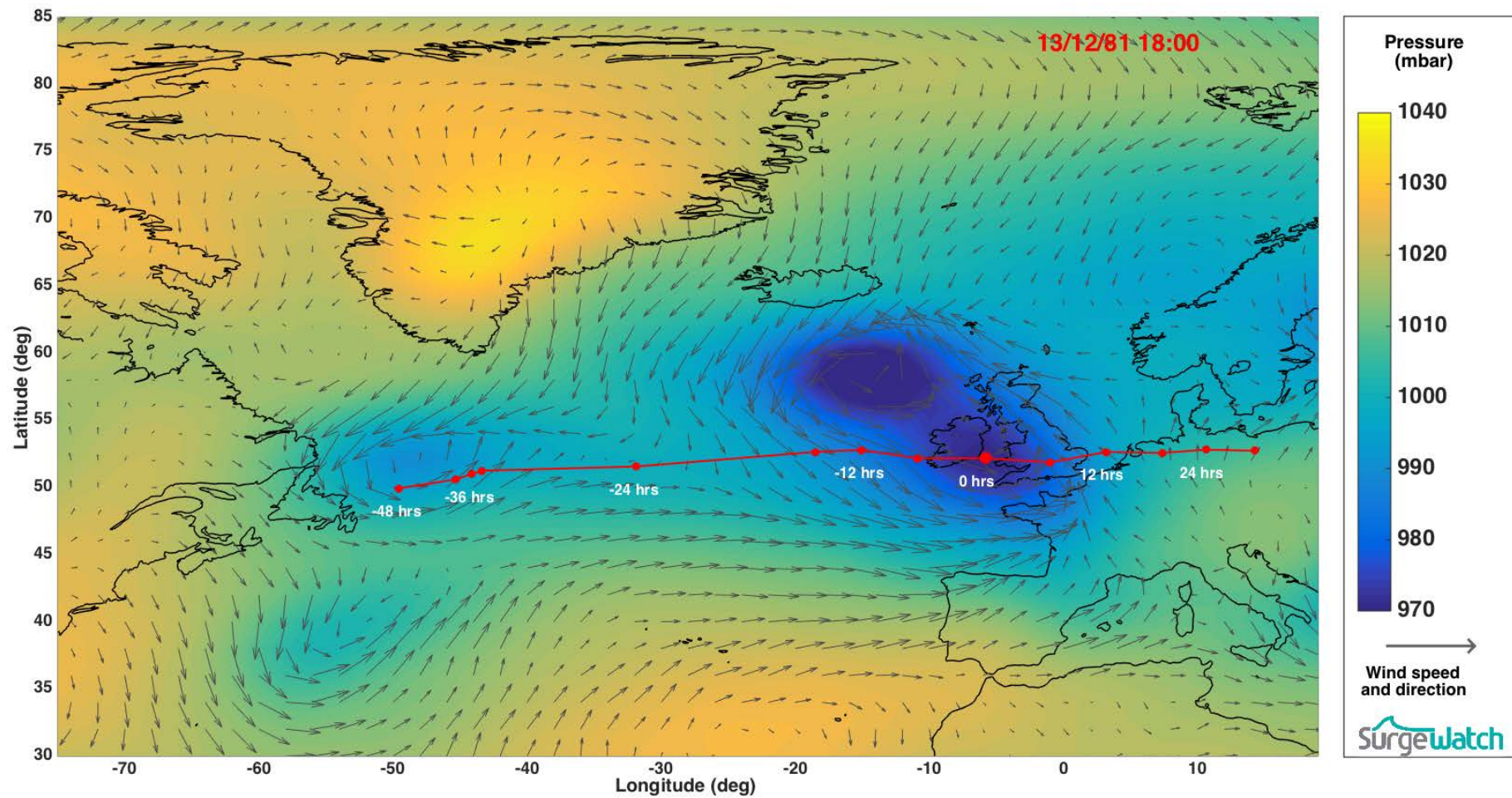


Figure 1: Meteorological conditions at time of maximum water level overlaid by the storm track

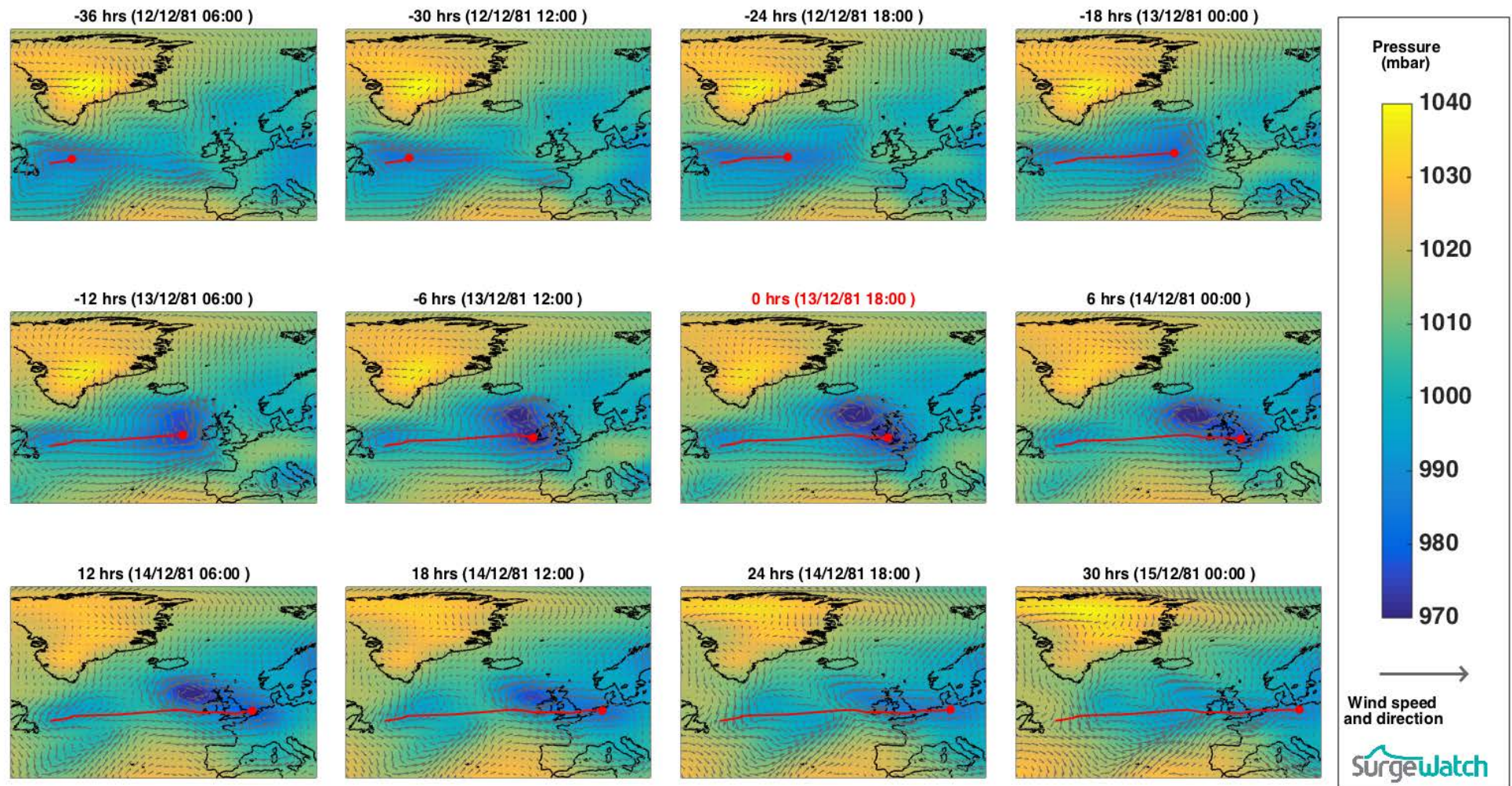


Figure 2: Meteorological conditions during event

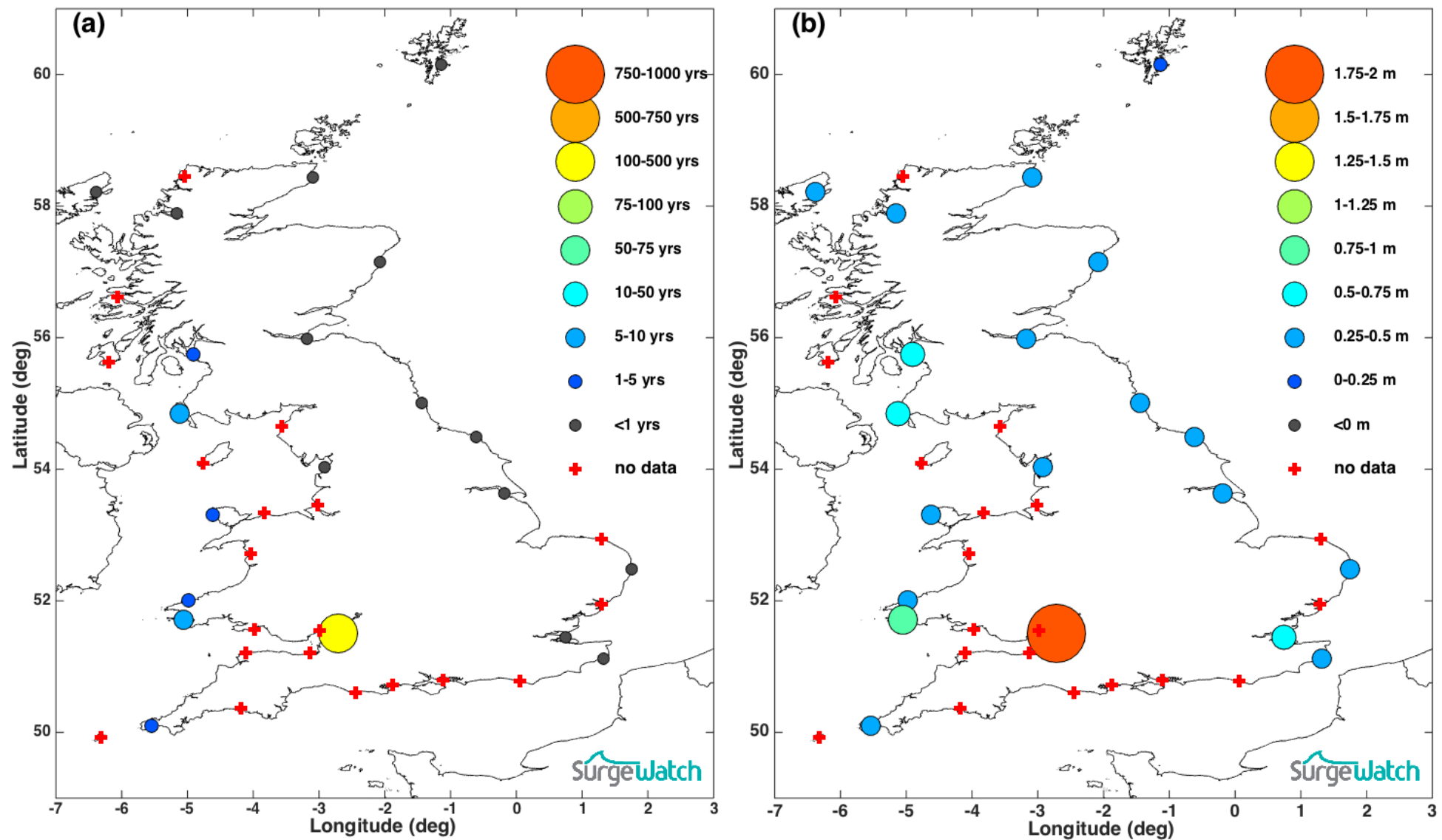


Figure 3: (a) Water level return period; (b) Skew surge levels

References

- CEFAS, 2010. *Hinkley Point sediment transport - potential impacts of sand and on new structures. BEEMS Technical Report 149*,
- Environment Agency, 2006. *Somerset and the sea: the 1981 storm - 25 years on*, Exeter.
- FADS Directory, 2011. Somerset Floods - 30 Years and £60M on. Available at: <http://www.fadsdirectory.com/news/somerset-floods-30-years-and-60m-on> [Accessed October 1, 2015].
- Haigh, I.D. et al., 2015. A user-friendly database of coastal flooding in the United Kingdom from 1915–2014. *Scientific Data*, 2, p.150021. Available at: <http://www.nature.com/articles/sdata201521>.
- Hovey, C. & Rodgers, N., 2010. Climate Change on the Severn Estuary. *IMCORE Climate Change Report Card*. Available at: <http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.730.5143&rep=rep1&type=pdf>.
- Met Office, 1981. Monthly Weather Report of the Meteorological Office. *Monthly Weather Report*, 98(12). Available at: <http://www.metoffice.gov.uk/learning/library/archive-hidden-treasures/monthly-weather-report-1980s>.
- Proctor, R., Flather, R.A., 1989. Storm surge prediction in the Bristol Channel - the floods of 13 December 1981. *Continental Shelf Research*, 9(10), pp.889–918.
- Ruocco, A.C. et al., 2011. Reconstructing coastal flood occurrence combining sea level and media sources: a case study of the Solent, UK since 1935. *Natural Hazards*, 59(3), pp.1773–1796. Available at: <http://link.springer.com/10.1007/s11069-011-9868-7> [Accessed March 27, 2015].
- Smith, R.A.E., Bates, P.D. & Hayes, C., 2012. Evaluation of a coastal flood inundation model using hard and soft data. *Environmental Modelling & Software*, 30, pp.35–46.
- The Bristol Post, 2014. North Somerset sea defences proved their worth during recent storms. *The Bristol Post*. Available at: <http://www.bristolpost.co.uk/defences-stand-on-slaught/story-20412810-detail/story.html> [Accessed October 11, 2015].
- The Weston Mercury, 2012. Flood Gallery 1981. *Weston, Worle, and Somerset Mercury*. Available at: http://www.thewestonmercury.co.uk/home/flood_gallery_1981_1_1451557 [Accessed October 11, 2015].
- Williams, J., Wilson, C. & Horsburgh, K., 2012. Research & Consultancy Report no 26: Re-analysis of the December 1981 storm surge event in the Bristol Channel using the current operational tide-surge model suite. Available at: http://eprints.soton.ac.uk/344760/1/NOC_R&C_26.pdf.

Additional sources of information

- BBC, 1986. Domesday Reloaded: a storm and flooding in 1981. Available at: <http://www.bbc.co.uk/history/domesday/dblock/GB-332000-165000/page/7> [Accessed October 10, 2015].

Burnham-on-Sea.com, 2011. In photos: The story of Burnham's 1981 storm. Available at: <http://www.burnham-on-sea.com/1981-storm.shtml> [Accessed October 11, 2015].

Wikipedia, 2016. December 1981 windstorm. Available at: https://en.wikipedia.org/wiki/December_1981_windstorm [Accessed October 11, 2015].

Wordblog Revived; incorporating new life, 2012. Nuclear planning reports fail to mention storm flooding and shutdown. Available at: <http://grant-adamson.me.uk/2012/03/nuclear-planning-reports-fail-to-mention-storm-flooding-and-shutdown/> [Accessed October 11, 2015].