

IMPACTS OF CLIMATE CHANGE ON MARINE AIR TEMPERATURE

Elizabeth Kent, David Berry¹ and Julian Hill²

¹ National Oceanography Centre, Southampton

² Meteorological Office

Executive Summary

Marine air temperature measurements made by [Voluntary Observing Ships](#) have been used in a new dataset of daily air temperatures and other marine meteorological variables currently under development at the National Oceanography Centre, Southampton. This dataset shows that the air temperature over the seas near the UK (7W:3E and 50N:60N) has risen over the period 1970 to 2004 at a similar rate to the [Central England Temperature](#) (CET, Parker *et al.*, 1992). However, there are strong regional variations in the linear warming trend over UK territorial waters. Marine air temperatures have risen faster than CET in the Eastern English Channel and across the whole of the North Sea. The Scottish Continental Shelf and North-West Approaches have seen a slower rise than CET and the Irish Sea, South-West Approaches and the Western Channel have seen marine air temperature increasing at a comparable rate to CET. Marine air temperature spatial gradients are thus increasing in the Northern North Sea.

Due to a decline in the number of reports from Voluntary Observing Ships our confidence in the estimates of marine air temperature has decreased over the last decade, both in UK waters and globally.

Sea surface temperature linear trends within UK Coastal Waters are broadly similar to marine air temperature in both magnitude and spatial pattern.

Level of Confidence

High

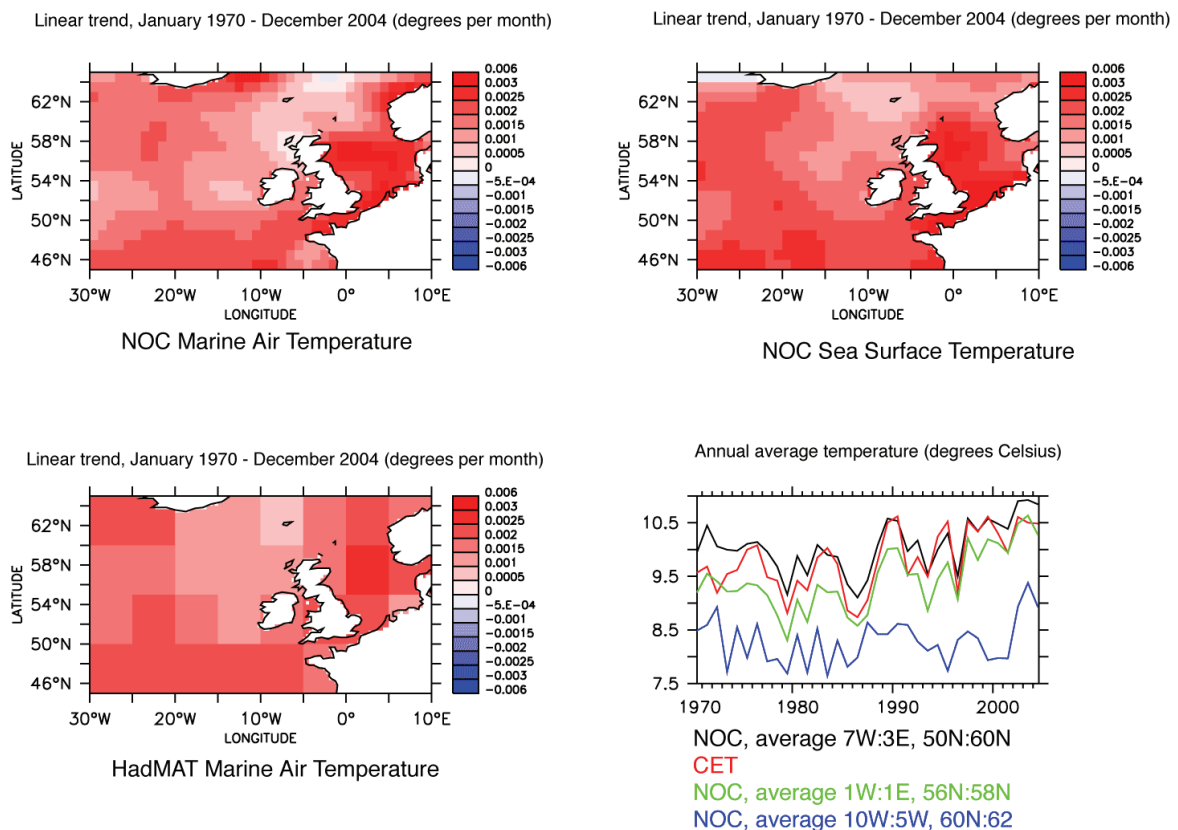
Key sources of Information

Parker, D.E., T.P. Legg, and C.K. Folland, 1992: A new daily Central England Temperature Series, 1772-1991. *Int. J. Clim.*, Vol 12, p317-342

Also see Supporting Evidence

Supporting Evidence

Marine air temperature over the ocean is measured from ships, buoys and marine platforms. Air temperature is not currently retrievable from satellites. The Hadley Centre produce 5° datasets of marine air temperature (MOHMAT, HadMAT1 & HadNAT2, Parker *et al.*, 1995; Rayner *et al.*, 2003; Hill *et al.*, *in preparation*). This spatial resolution is not sufficient to show details of the spatial variability in air temperature near the UK, so here we use marine air temperature from a new dataset under development at the National Oceanography Centre, Southampton, which presents daily air temperatures on a 1° grid (although the true spatial resolution is somewhat coarser than 1°). Confidence in the new dataset is gained through agreement with the well-established Central England Temperature timeseries (CET, Parker *et al.* 1992, panel lower right, red line) and through similarities with the Met Office datasets (panel lower left).



Adjustments have been applied to the marine air temperature to account for spurious daytime heating (Berry *et al.*, 2004). This allows us to use daytime observations. In contrast the MetOffice datasets use night-time marine air temperature observations only.

Although relying on Voluntary Observing Ships (VOS) for information on marine air temperature we note that the number of observations collected, in UK waters and globally, has declined in recent years. Uncertainty in marine air temperature fields near the UK has increased by approximately 50% since the mid-1990s.

Please acknowledge this document as: Kent, E., Berry, D. and Hill, J. (2006). Impacts of Climate Change on Marine Air Temperature in Marine Climate Change Impacts Annual Report Card 2006 (Eds. Buckley, P.J, Dye, S.R. and Baxter, J.M), Online Summary Reports, MCCIP, Lowestoft, www.mccip.org.uk

References

- Berry, D. I., E. C. Kent and P. K. Taylor, (2004). An analytical model of heating errors in marine air temperatures from ships, *J. Atmos. Ocean. Tech.*, 21(8), 1198 - 1215.
- Hill, J.G.T., Brohan, P.B., Rayner, N.A., Kennedy, J., Parker, D.E., Kent, E.C., Berry, D.I. and Tett, S.F.B. (*In Preparation*) Is night-time marine air temperature a better measure of global climate change than sea surface temperature
- Kent, E.C. and D. I. Berry, (2005). ICOADS Data Quality Version 1, Unpublished Document, 42pp. [available from http://www.noc.soton.ac.uk/JRD/MET/noindex/JGS/icoads_quality_v1.pdf]
- Parker, D. E. and Folland, C. K. and Jackson, M. (1995) Marine surface temperature: observed variations and data requirements, *Clim. Change*, 31, 559 – 600
- Rayner, N. A., D. E. Parker, E. B. Horton, C. K. Folland, L. V. Alexander, D. P. Rowell, E. C. Kent and A. Kaplan (2003). Global Analyses of SST, Sea Ice and Night Marine Air Temperature Since the Late 19th Century, *Journal of Geophysical Research* 108(D14), DOI: 4407,10.1029/2002JD002670