Letters

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August 2003 heatwave

Burt and Eden (2004) appear to have set out, perhaps rightly, to discount some of the highest temperature readings near London, particularly on 10 August 2003. I am not convinced that averaging across sites is an acceptable method, since it could be used to eliminate almost all of the older records if taken to extreme. In such a light and varied airflow that had existed prior to this day, pockets of very warm air would have been generated within the London heat island and then advected beyond it, quite apart from differential heating imposed on the air as it approached individual sites. Consequently, the Met Office (2004) statement seems justified.

Burt and Eden give the impression of a motley collection of poor climatological sites. Two improvements could be made. It was evident from the photographs that most of the enclosures were devoid of grass. This is acceptable when representative of the surrounding area but often it is self-induced through over-exuberant grass cutting in early summer. It would occur less often if the grass were not cut shorter than about 4 cm during May and June. Also, most of the Stevenson screens were of the large variety. These look impressive, but my experience with the broad wet-bulb wicks, introduced last year, is that the evaporation rate from these wicks is much faster in small screens than in large ones, implying that the airflow through small screens is greater, which would eliminate excessively high temperature measurements.

A general concern for me is that the high temperatures observed during August might be linked with global warming and not perceived as the consequence of urbanisation in its many forms. One has only to conjecture what the temperature might have been on Hounslow marshland a century ago in the same synoptic situation, long before the westward expansion of London and the construction of Heathrow Airport, to see where the real problem lies.

References

Burt, S. and Eden, P. (2004) The August 2003 heatwave in the United Kingdom: Part 2 – The hottest sites. *Weather*, **59,** pp. 239–246

Met Office (2004) The August 2003 heatwave in the United Kingdom – a statement by the Met Office. *Weather*, **59,** p. 246

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Stephen Burt replies:

Frank Hill makes a number of comments regarding the August 2003 heatwave, only some of which are directly related to the summary of the events published in this magazine (Burt 2004a,b; Burt and Eden 2004). For the sake of brevity I make only three comments in response to the points he makes.

Firstly, and to avoid any possible doubt in this regard, there was no intention at the outset to "discount some of the highest temperature readings near London, particularly on 10 August". During the course of data analysis and whilst preparing the papers it became clear that reported maxima at a few sites did not appear to fit the general distribution. These values were objectively tested for fit by a variety of methods, some of which are described in detail in Part 2. A few were obvious errors (of date etc.) and were quickly corrected; others were resolved by discussion with the Met Office. The reasons for a few remaining anomalies were not so easily identifiable. In all cases the original reported value was used wherever possible and all values were given 'the benefit of the doubt'. Where it was felt that, even with this considerable leeway, an observation was simply 'unrepresentative' it was not used. A few of these omitted values were amongst the highest, and the particular circumstances of each of these were examined as carefully as the available site and record information allowed; these conclusions were given in some detail in Part 2. I am sure that Mr Hill would agree that the objective analysis and presentation of data is (should be) a core tenet of any scientific investigation. The objective of this investigation was to document the summer 2003 heatwave in as full and reliable a manner as the observations permitted; there was no 'hidden agenda' to discount any particular record or site(s) and I am grateful for the opportunity to make this clear.

Secondly, the treatment of older extremes is a moot point. It is indeed highly likely that a number of existing extremes – of temperature specifically, but other meteorological elements too – may be found wanting where subjected to rigorous analysis and modern standards of exposure and instrumentation. This is nothing new; the maximum of 38.1 °C reported from Tonbridge, Kent, in July 1868 was quoted for over a century as the UK extreme until carefully reviewed (and rejected) by Joyce Laing (Laing 1977), while the Gunby, Lincolnshire, maximum of 35.6 °C in July 1959 was corrected by Philip Eden in 1991 (Eden 1991). It is self-evident that maximum temperatures at a few well-known highly sheltered sites, such as Camden Square in north London (observational record 1858–1969), are not representative of the wide area required (at least nominally) for modern climatological and synoptic sites, and for this reason should not be quoted without reservation. However, almost any site can be 'nitpicked' and, as I pointed out in Part 2 of the paper, there are few 'perfect' climatological sites – particularly in dense urban areas such as London where the luxury of space to provide an open and unobstructed exposure without risk of vandalism or interference is all too often not available.

Finally, I am concerned with the implication in Mr Hill's closing paragraph that the extremes of temperature observed during

summer 2003 were "the consequence of urbanisation in its many forms". This is simply not borne out by the evidence. Careful examination of the available long-term records for south-east England, for both rural and urban locations, stretching back over 150 years, confirms that the highest temperatures recorded during summer 2003 were 1–1.5 degC above the highest Stevenson screen-equivalent extremes recorded anywhere in the United Kingdom prior to 1990. Some of the more notorious 'hot spots' on the historical record (Camden Square, for example) were already surrounded by dense urban fabric more than a century ago. Prior to August 2003 the previous highest maximum temperatures on record for north London (Camden Square and Enfield, for example) were fractionally above 36 °C; August 2003 saw reliable values just short of 38 °C in this area. At other more rural sites, such as Wisley in Surrey, the August 2003 extreme of 37.8 °C was a similar 2.2 degC above the previous site highest in August 1911, on a record extending back to 1904. Urbanisation of nearby towns and increasing site shelter will have had some effect on the Wisley record, but the effect is unlikely to be as much as 2 degC. I believe that the effect of urbanisation in south-east England in August 2003 compared with, say, the heatwaves of July 1868 or July 1881 in London was to enlarge the areas affected by very high temperatures, rather than to 'generate' the extreme temperatures themselves. As for the contribution or otherwise of global warming to the extremes recorded during summer 2003, I will leave it to others to speculate. The two words 'global warming' do not appear within any of the three papers summarising this notable heatwave for good reason.

References

Burt, S. (2004a) The August 2003 heatwave in the United Kingdom: Part 1 – Maximum temperatures and historical precedents. *Weather*, **59,** pp. 199–208

—— (2004b) The August 2003 heatwave in the United Kingdom: Part 3 – Minimum temperatures. *Weather*, **59,** pp. 272–273

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Mesoscale cold front on 10 August 2003

The article by S. Burt in the August 2004 issue (Burt 2004) raises some very interesting points relating to the apparent mesoscale cold front which developed ahead of the main frontal boundary, located from eastern Scotland down the Irish Sea on the morning of 10 August 2003.

Most of the data concerning the mesoscale feature seem to be concerned with areas further south. In view of this, I thought my own surface observations near Ripon on that quite exceptional morning may be of interest, inasmuch that here at Wath village (4 miles (6 km) north-east of Ripon) I may have been observing the genesis of this front. At 0930 BST the sky was excessively hazy though apparently devoid of cloud. Quite suddenly, from out of the haze due south, there appeared one plume of towering cumulus cloud, typically like a plume of steam. The rapid violence with which the towering head ascended seemed totally to outgrow the solidity of its structure, almost orange in appearance amid the haze. Within minutes, the cloud quickly dissolved. Between 0930 and 1000 BST our maximum temperature was attained, 27 °C – a record for so early in the day. Just before 1000 BST, loud continuous thunder was heard to the south-west with a visibly blackening horizon. Heavy rain began to fall just after 1000 BST, lasting just 10 minutes with 11 mm recorded and a few large hailstones contributing to this total. The storm was in the embryonic stage as it moved to the west of Wath, onward in direct line to Leeming village. Immediately behind it came a sudden veer of wind from southerly force 1, to west-north-westerly force 6–8 in squalls. The temperature fell from 27 to 21 °C within minutes.

Further afield, in the Nidderdale villages of Stean, Lofthouse and Middlesmoor, some 20 miles (32 km) to the west into the foothills of the Yorkshire Dales, a mini tornado did destructive damage and as the core of this system fringed our area and crossed to Leeming village, 8 miles (13 km) to the north, large trees came down in near-total darkness with wind gusts close to hurricane force. The intensification of this storm in terms of rainfall was certainly well marked and it would be interesting to know how my relatively small reading in a small measure of 10 minutes compares with that at RAF Leeming. It seems likely that the 45 mm record of Carlton-in-Cleveland (Cinderey 2005) further illustrates the intensity of the same storm system.

Burt's (2004) reference to hot Continental air being advected across south-eastern England would appear to fall a little short. It seems quite conceivable that some of this was certainly advected up the Vale of York which became a virtual cauldron of heat and humidity, shown by the exceptionally high temperatures so early in the day. Furthermore, the cooler air from Lancashire must have come into the equation, coupled with the steep valley topography of Nidderdale causing violent ascent. All this atmospheric volatility could be observed to perfection – looking at the absolute trigger point of that lone cumulus plume which developed almost out of nothing, but was the obvious forerunner of exceptional events!

References

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Cinderey, M. (2005) The NorthYorkshire–Teeside storm of 10 August 2003. *Weather,* (In Press)

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Hailstorms

Colin Clark's analysis of the July 1808 hailstorm in the July 2004 issue ("The heatwave over England and the great hailstorm in Somerset, July 1808", *Weather*, **59,** pp. 172–176) raised an interesting question as to whether hailstorms have become less frequent and severe in recent years. He did not mention the storms of 1 July 1968, but I am not aware of any comparably severe storm in the UK since then. That storm was clearly in a much lesser league than those of 1808 which, had they occurred today, would have done much more damage than break glass and destroy crops.

Is it realistic to consider that the reduced incidence may be linked to, and be a beneficial consequence of, recent global warming? A couple of observations:

(i) Hailstorms are most destructive of agriculture; the fact that modern economies are much less dependent on agriculture than in the past may result in a lower focus on hailstorms (although surely not extreme ones).

(ii) It would be interesting to know whether UK experience was matched by the nearby Continent – in particular France (with its continuing large agricultural base) and The Netherlands (with its hectares of exposed glass).

Is it a reasonable hypothesis that in a warmer world the incidence of extreme thermal contrasts required for a severe hail-