



Comparing the average person's and global mean warming since the preindustrial

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The ambition of the Paris Agreement is to limit global warming to “well below 2°C above preindustrial”, yet the Agreement provides no baseline for when this preindustrial reference period occurred. For practical reasons 1850-1900 is commonly chosen as baseline, although earlier reference periods are better justified from a radiative forcing perspective. Here we create a gridded temperature dataset from 10,000 ensembles with uncertainties that has been adjusted to a more rigorous definition of the preindustrial, namely the forced component of the average from 1400-1800. Rather than linear pattern scaling, we employ a novel pattern scaling technique that not only reconstructs the mean pattern and local uncertainty, but critically also retains the spatial covariances between locations in its reconstructed patterns to create an annual-resolution dataset of local temperature anomalies from the preindustrial along with quantified uncertainties. The warmest year on record (2016) was 1.26°C above this preindustrial, with a 3.19% chance it was more than 1.5°C above it. We further explore how the spatial pattern of warming intersects with that of the human population. When accounting for urban heat islands, we find that the average person was exposed to temperatures 1.73°C above preindustrial in 2016. We conclude that at a global level, the urban heat island is at least as important as the role of population distribution when calculating the average person's temperature experience. The long-term trends of increasing urbanisation and further temperature increases suggest important health impacts on societies in the decades coming.