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A late 20th century European climate shift

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Evidence that earth's atmosphere has been warming during the last decades is unequivocal and is attributed to the gradual increase in greenhouse gases, in particular carbon dioxide (CO_2). However, the notion of a "global" and "gradual" warming is to some extent misleading: changes can occur rapidly, and there are regions that have been warming faster or slower than the global mean.

Here we report a previously undocumented yet statistically highly significant change point in atmospheric temperatures over Western Europe around 1987-1988 ($p > 99.9999$ % or $p > 5\sigma$) with an average warming of about one degree Celsius. This change point does not coincide with any known mode of multidecadal internal climate variability. A global analysis reveals many change points in both reanalysis data and surface temperature reconstructions not found in satellite temperature records, indicating that many temperature datasets suffer from non-physical contamination. The presence of such inhomogeneities seriously hampers data analysis from the perspective of abrupt climate change. An important consequence of our results is that the absence of a general warming in certain regions and increased warming in others cannot be seen as "proof" of warming, or lack thereof, but are an integral part of the way climate varies.