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Bridging the gap from caldera unrest to resurgence

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Calderas often inflate up to a few metres for weeks to years, which is evidence of short-term unrest. Some calderas also show larger uplift (up to a thousand metres), achieved over the long-term (hundreds to thousands of years), manifest by a resurgent dome or block. How the short-term inflation relates to long-term resurgence is still poorly understood, even though established views consider the two processes distinct. This study exploits the longer deformation time series now available for several calderas, as well as the better understanding of magmatic processes and their evolution, to try to bridge the gap between these two scales of uplift. Available data challenge established views, suggesting that resurgence, rather than being produced by constant or continuous uplift, is the net cumulated result of tens to thousands distinct episodes of inflation, even interrupted by deflation episodes, as observed on short-term unrest. These inflation episodes are ascribed to distinct pulses of shallow magma emplacement, with most of the magma remaining intruded, especially in felsic calderas. This supports an incremental growth of magmatic systems, consistently with that observed below resurgent calderas and what is inferred for plutons. Comparing the uplift (as expression of the intrusive record) and eruptive histories or resurgent calderas opens new exciting research paths to understand the causal relationships between intruded and erupted magma at a given caldera, thus enhancing its long-term eruptive forecast.