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Overlooked geological and human-historical evidence that sea-level rise will approach or exceed IPCC worst-case scenario, regardless of human action

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This review omits citations to save space. The current sea-level (SL) rise began c.1700CE (earliest tide gauges), totals c.30cm so far, and is gradually accelerating (now c.2.5mm/y). The Intergovernmental Panel on Climate Change (IPCC) is alarmed, believing no other centennial rise or fall since 2ka exceeded 1mm/y or 25cm total. This starkly contradicts archaeological evidence in tectonically stable England where a 3-5m (sic) SL change for each of the Roman Regression (RR; Roman occupation 43-410CE), Romano-British Transgression (RBT, = Dunkirk II Transgression) and Little Ice Age Regression (LIR) is demanded by: (i) mapped c.200CE and c.1000CE coastlines now far (10s km) inland, c.5-6m above modern mean SL (MMSL); (ii) at least 1.5m progressive downshift of excavated Londinium quays; (iii) late Roman hut floors c.1m below MMSL in London; and (iv) many examples of 1000-1500CE lowland "reclamation" and supposed "silting" of former estuary-head ports. The RR-RBT SL cycle was driven by a renowned climate cycle (Roman Warm Period (RWP)-Dark Ages Cold Period-Medieval Warm Period (MWP)), of the solar-driven, millennial (1-3ky) type pervading the Phanerozoic geological record. Based on Ljungqvist's NH temperature curve, the RR was c.200-500CE (cooling), RBT c.500-1000 (warming), and LIR c.1000-1700. Corresponding SL changes estimated here, adjusted for 1-2 mm/y GPS-measured subsidence, are RR 3m (starting 5m above MMSL), RBT 5m and LIR 7m; the implied RBT rate of rise was 5m in 500y (av. 10mm/y; faster at inflection). Similar rises and timings are indicated by a high-resolution SL curve based on Red Sea foram isotopes: 2m fall (150-550CE), 7m rise (550-950; 17mm/y), 6m fall (950 to 1750 end of 5-point-smoothed curve). Moreover, the same curve shows other 5-14m oscillations since 8ka in the current interglacial and, in the previous interglacial, two rises and two falls of 4-13m, with peak rise rates of 11 and 20mm/y (coral data show even faster rates). IPCC's contrary belief in non-oscillating SL since 2ka is based on four kinds of evidence: (1) Italian seaside fish tanks constructed c.2ka, now drowned only 1-2m; (2) in Caesarea, Israel, <1m variation in bottom elevation of 64 coastal water wells thought to span c.0-1100CE; (3) on Kiritimati atoll, <1m elevation contrast among coral microatolls dated 6-0ka; and (4) peri-Atlantic saltmarsh peat 1-3m thick whose microfossils and C14 ages suggest <1m SL variation since 2ka. However, all four are flawed: (1) the fish-tank evidence is blind to later rises and falls whose sum equals the net drowning, corrected for 1-2mm/y GPS-measured subsidence; (2) the wells in Israel are only weakly dated (typology of latest pottery shards identified at base of fill) and could all be 5th-6th century (SL low), gradually backfilled by later cultures due to rising brackish water driven

by the RBT; (3) microatoll ages are clustered and have wide error bars allowing centennial gaps, each likely to hide a fast metric rise that drowned the microatolls and submerged the low-lying atoll too deeply for highstand recolonisation; and (4) all peat age-depth graphs comprise two linear segments (C14-dated- vs younger samples) that oddly meet at a sharp inflection, usually interpreted as a sudden increase in SL rise but more likely indicating C14-age exaggeration by an overlooked estuarine reservoir effect; projecting the post-C14 segment back in time suggests the entire peat section is post-1400CE (i.e. post-dates most of LIR). Intertidal fixed biological indicators, likewise said to indicate near-stable SL since 2ka, in fact intrinsically underestimate SL oscillations, being easily eroded/dissolved during and after SL fall, and hard to find after a rise; and again centennial gaps may conceal highstands. In flooded Cosquer Cave, France, a claim that a Paleolithic painting of two legless horses slightly (cm-dm) above the water level reflects leg erasure by the rising (but calm) sea water and implies SL was never higher, fails because (i) the supposed erasure line is not horizontal (c.30°) and (ii) most (>10) other paintings higher on the walls and ceiling are head-and-shoulders only, or at least footless. Moreover, all Cosquer paintings are faint, consistent with immersion during higher SL (MWP), unlike sharp coeval paintings in terrestrial caves worldwide. In conclusion, in the latest natural millennial climate cycle (MWP-Little Ice Age-Modern Warming), SL rise is now accelerating out of the 1700CE lowstand, towards a peak rate likely to approach or exceed IPCC's worst-case prediction of 15mm/y by 2100. SL rise and the causative warming (not yet quite as warm as RWP or MWP?) will probably last another 200-400y and exceed 4m, whether or not humans cut emissions.

