



Understanding the complexity of decay pathways: a case study of granite building stone weathering in Rio de Janeiro

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Periodic survey of a granite church in the centre of Rio de Janeiro over a period of fifteen years has identified a complex pattern of decay near to ground level, associated with the crossing of strength/stress thresholds in response to pollution-derived and marine salts. Early observations recorded limited soiling by iron compounds, gypsum and carbonaceous crusts and isolated contour scaling indicative of limited surface change over a prolonged period of exposure. Intermediate observations five years later identified a significant increase in surface staining and the dimensions of individual scales together with the development of a near-surface micro-fracture network that allowed gypsum migration to a depth corresponding to scale thickness. Recent observations reveal a dramatic increase in the scaled area and progressive granular disaggregation of scaled surfaces associated with extensive micro-fracture networks, especially in areas of architectural detail where convergent decay can result in significant surface loss. These observations are used to demonstrate that it is possible, even in a wet Tropical environment, for salt-related decay to occur where pollution levels are particularly high. The time sequence is also used to explore the applicability of a decay model in which rapid surface loss results from the breaching of threshold conditions associated with a progressive loss in material strength combined with the gradual accumulation of internal stresses. The consequences of this model are explored in terms of the interpretation of spatially discontinuous decay patterns and the importance of adopting conservation strategies that do not of themselves trigger rapid decay.