Understanding the dynamics of pyroclastic density currents (PDC) is mainly derived from interpretation of their deposits. We compare ancient and recent dune bedforms formed by PDCs from Ubehebe (USA), Stromboli (Italy), Laacher See (Germany), and Tungurahua (Ecuador) volcanoes and re-evaluate some proposed emplacement mechanisms. Bedforms at Stromboli and Ubehebe are small, smooth (lengths: 0.3-3m, heights: 5-30cms), and fine-grained. They often occur in trains, yielding wavelength. Low angle cross-stratifications usually dip downstream, but we also observed stoss-depositional climbing dunes and occasional backset laminated bedforms at Ubehebe. We follow former authors that interpreted them as antidunes (formed under supercritical flow) and derive information from the wavelength. Bedforms at Laacher See and Tungurahua are larger and steep (stoss and lee angles up to 35º). Most bedforms are stoss-depositional climbing dunes showing upstream migration of the crest punctuated by erosive events of the stoss side only. Another type of bedform observed at Tungurahua and Laacher See is characterized by smooth, lensoidal backset laminae. We re-evaluate the former interpretation that these structures are antidunes and “chute and pool” (cyclic steps) structures but cannot settle whether they are formed by accumulation against topography due to high particle concentration or another process. Comparable structures are observed independently of grain size distribution in PDCs and turbidites. Thus grain size, temperature, cohesion, and nature of transporting fluid are not critical factors in creation of these bedforms. More likely, bed steepness and the rapid deceleration of fast and short-lived density currents are the key factors.