

ABSTRACT

The Avon-Heathcote is a small, microtidal, predominantly intertidal, weather-dominated estuary. It has experienced large alterations to its physical environment as a result of the establishment and growth of the adjacent Christchurch City, on what was previously a swampy, dune-bordered coastal plain. During the period 1850-1920 the tidal compartment decreased by 30%, then returned rapidly to its original volume. It has since increased to about 30% more than its pre-European volume. The inlet area progressively changed its configuration to accommodate these alterations in volume.

An analysis of the energetics of waves and tidal currents shows that wave-induced shear stresses predominate in this estuary, particularly above the MTL, and are only exceeded by tidal current stresses in and adjacent to subtidal channels, where tidal velocities exceed 60 cm/s. Because of depth limitations the largest waves in this estuary normally have periods of 1.4 s, amplitudes of 30 cm and lengths of 3.5 m. Wave energy gradients are due to downfetch variations in wave frequency, not variations in wave size.

The muddiest sediment occurs close to the entrances of the Avon and Heathcote rivers, and patterns of mud deposition are regulated both by rates of sediment supply and by wave energy. The sand fraction of active surface sediment can be divided into two groups - one consisting of a single population deposited solely from saltation, the other consisting of a mixture of this saltation population, and material deposited from suspension. Sand is only deposited from suspension near the two river entrances, or on intertidal flats below the MTL, where wave shear stresses are less than 2 dynes/cm².

Shallow cores reveal that a record of the history of this estuary is preserved in its subsurface sediment. An abiologic, pre-estuarine/estuarine pre-European/estuarine post-European sequence is recognised beneath a 15-20 cm deep bioturbation interface. Above this interface benthic animals have produced a homogeneous mixed layer, depleted of suspendible fines, which is overlain by a thin and commonly quite different active layer. The active layer exists independently of trends in net erosion or deposition of sediment.