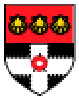

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An Analysis of Sea Breezes on the South Coast of England and Evidence of Pre- and Post-Frontal Waves at the Surface.

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ABSTRACT

This study investigates sea breeze formation on th e South coast of England using high temporal scale data taken from Chimet, a weather recording station based at the entrance to Chichester Harbour. A program is created to detect sea breeze fronts in the data for 2003. The program detects the fronts on the basis that there will be a change in wind direction, wind speed, gustiness and temperature as the front crosses the Chimet recording station.

Two scales of analysis are considered. Firstly the synoptic scale is studied and effects of prevailing winds a nd differentials between sea surface temperature and air temperature were investigated. Onshore winds before the sea breeze cause less distinctive fronts which tend to cross Chimet after 1200UTC. Fronts formed on days of opposing synoptic winds are more distinctive due to greater density differences across the front and cross Chimet before 1300UTC. Effects of temperature differences were not clear due to the Sea surface temperature data used which was found to be unreliable.

Smaller scale waves can be identified in surface parameters on certain sea breeze days. Wind speed gives the best indicator of the waves followed by pressure and temperature. The wavelengths tend to increase from an initial 5km and then decrease as the waves disintegrate. The waves may be formed by a Kelvin Helmholtz instability at the top of the sea breeze head where the greatest shear stress is found and billows propagate away from the front. The instability is a result of denser sea air underneath dryer less dense air resulting in mixing at the point of maximum shear to try to redress the imbalance. The mixing can act to destroy the front or slow down the inland propagation. Oscillations in surface parameters were most visible on days when there was little change in wind direc tion as a result of the sea breeze front. There is support for this result from the gravity current laboratory experiments conducted by Simpson (1994). Alternatively the waves may have worked themselves out before reaching Chimet.

Numerical simulation stu dies have dominated the study of Kelvin Helmholtz billows at sea breeze fronts and more observational studies are required to compare results. The investigation of wave-like features and synoptic conditions is a new area and one that requires further study to advance knowledge of turbulence within the sea breeze.

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