

Nested UM simulations of downburst winds during Tropical Cyclone Pam (2015 Southwest Pacific TC season)

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Tropical Cyclone Pam (March 2015) was a Category 5 cyclone and the costliest in Vanuatu's history, with large impacts including 16 fatalities and over US\$500M in damage, particularly in the southern half of Vanuatu. In a recent effort, one-way nested very high-resolution Unified Model (UM) simulations (initiated at 6 hourly intervals) were produced over the period that TC Pam was near Vanuatu. We thus gained estimates of mean wind speeds and gusts to assist in return period analyses for parts of Vanuatu. In the highest resolution (100m grid spacing) simulations an interesting, and unexpected, finding was that in strong, moist, sheared and unstable S-SW flow around 200 km west of the eye, where winds and impacts were much less, a downburst event was modelled to occur near the town of Luganville on the island of Espiritu Santo. In this presentation, key characteristics of the synoptic environment and downburst evolution will be provided and compared with those from idealised numerical simulations and the extremely limited reported hindcasts (forensic forecasts) of downburst events in the scientific literature. There are important questions around this, since 100 m resolution NWP capabilities are close to being in scope for many operational forecast centres. There is much active research into this urban or city-scale NWP, notably with international efforts such as the Paris 2024 Research Development Project (https://www.umr-cnrm.fr/RDP_Paris2024/) developing a city-scale model for the 2024 Olympic host cities of Paris and Marseille, and it is not yet established if these models have a bias towards over-forecasting the occurrence of such phenomena.