Depiction of the Trend and Variability of Pineapple Express Events by Eight Global Reanalysis Datasets

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We investigate the climatology and variability of the Pineapple Express (PE) events using a combination of eight global reanalyses. PE events along the Pacific coast of North America have been attributed to extreme flooding in the western United States. Under the climate warming scenario, in which tropical moisture content increases in association with lower tropospheric warming, it is possible that increased tropical moisture will be transported towards North America through PE events. Because PE events are a large-scale phenomenon covering the vast Pacific Ocean, global reanalyses provide the best data coverage for the analysis of their climatology. We are interested in determining whether a change in the relative frequency, duration, and intensity of such events can be determined from the full records and different sources of reanalysis data.

The synoptic structure of PE events has been comprehensively documented. Thus, to determine the conditions leading to PE events, we create an index to isolate 10 "classic cases" that correspond to either literature or news coverage. The index for PE events is created by considering (1) The southerly and westerly components of column integrated water vapor flux (**Q**) at two locations, upstream and downstream of the precipitation region, (2) geopotential height at the 200 mb level in the Gulf of Alaska, and (3) precipitation amounts along the West Coast. The index constructed here is termed the "PE index" and, is used to isolate PE events. A composite of synoptic conditions associated with these PE events are verified against the classic cases using three Reanalysis data (NCEP/NCAR Reanalysis I, NCEP/DOE Reanalysis II, NOAA-CIRES 20th Century Reanalysis V2 (20CR)), and the NCEP/Climate Prediction Center precipitation data. We run this PE index from October through April over 61 years (1950-2010) for NCEP1, 59 years (1950-2008) for 20CR, and 32 years (1979-2010) for NCEP2. The selected cases used in the analysis agree well with each other and are shown in Figure 1. Figure 1(a)(b)(c) shows the composite **Q** circulations and precipitation of these 10 PE events for each reanalysis. The total number of days and the number of events of the identified PE cases (which must last for longer than 2 days) are plotted in Figure 2(a)(b) respectively. Throughout the 61 years, the frequency of PE events has not changed much, but NCEP2 shows disagreement in the trend over the recent 32 years. However, all three reanalyses agree with a marked multi-decadal variability that has a predominant frequency of 10-20 years.

Following a similar method, we will analyze PE events using four other reanalyses: (a) NCEP Climate Forecast System Reanalysis (CRSR), (b) NASA Modern Era Reanalysis for Research and Applications (MERRA), (c) ECMWF Reanalysis 40-year Project (ERA-40), (d) ECMWF Interim Reanalysis (ERA-Interim), and (e) Japanese 25-year Reanalysis (JRA-25). Intercomparison of the depiction of PE events by the various reanalyses will facilitate the assessment of uncertainty in any long-term changes of these events. A method to quantify the PE event intensity will also be developed and incorporated into this study. The intercomparison results of the synoptic property, trend, and climate variability of PE events will be presented in the conference.

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Figure 1 (a) (b) (c)

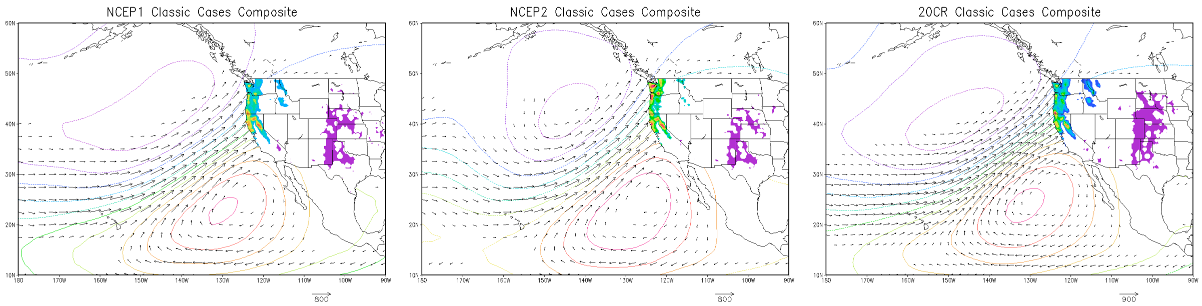

Figure 2 (a) Figure 2 (b)