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Goddard Space Flight Center
Greenbelt, Maryland 20771

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Tropical Rainfall Measuring Mission

El Niño Forecasting

The goal of weather forecasters is always to make accurate predictions—for longer and longer periods into the future. Today, we take it for granted that our local forecasts are generally accurate for the next several days, and fairly accurate for the next week. Just a few years ago, the idea of predicting weather beyond a week would have seemed an unlikely dream. Yet the dream is coming closer to reality. This does not mean that we can always predict which day the rain will start or the drought will end, but rather we can provide a general prediction of the weather over a growing season or year—will it be warmer or cooler than normal? Will it be wetter or drier than normal?

A major advance in tropical climate prediction has come from knowledge that scientists have gained about the phenomenon known as El Niño. An El Niño event begins with an eastward spread of warm ocean water that is usually confined to the western Pacific. Towering cumulus clouds form and move eastward across the Pacific as they are generated by the warm surface waters. The resulting change in latent heat release has global impacts. Flooding in South America and drought in Indonesia and Northern Australia almost always coincide with an El Niño. The warmer water off the coast of Peru leads to a serious drop in the number of fish available for the fishing industry. The droughts in Australia and Indonesia are responsible for the reduced crop yield and frequent forest fires in those regions, and El Niño is known to cause severe droughts and floods in the Asian monsoon region.

It is now known that, for much of the world, El Niño is responsible for the greatest variability in climate on a year-to-year basis. Since the Tropical Rainfall Measuring Mission (TRMM) is focused on the tropics, it is especially suited for validating and assessing the consequences of El Niño events. The significant role played by El Niño suggests that if we can acccurately predict an occurence, we can follow that forecast with a more accurate prediction of related climate events. For example, in the United States, an El Niño often causes warmer than normal winters in the Northwest, with excessive rainfall in the Gulf Coast states.

However, a good El Niño forecast does not always foreshadow a good climate forecast in the regions outside the tropics. Until now, regional climate forecasting over the North American continent based on El Niño has been only marginally skillful because of the strong control of large-scale circulations. We must not forget that El Niño events, important as they are, are not the only source of seasonal-to-interannual

variations. There are other sources of strong, seasonally varying changes that must also be taken into account.

A strong El Niño event has occurred during the winter of 1997-98. Expected climate changes, based on knowledge of this approaching El Niño appeared in an Aug 13, 1997 "diagnostic advisory" issued by NOAA's Climate Prediction Center. The advisory stated "....we expect drier than normal conditions to occur over Indonesia and eastern Australia during the next several months....Rainfall should continue to be heavier than normal from central Chile eastward across northeastern Argentina, Uruguay, and Southern Brazil."

Knowledge of the current El Niño provides the basis for predicting climate change months in advance and is a factor in predicting midlatitude weather tendencies. It is important not only to predict when the El Niño event will occur, but also what its characteristics will be.

The earliest predictions of El Niño events on a scientific basis go back at least to the early 1980's. Predictions made at that time appeared to be good for several months in advance, and by the late 1980's other predictions were being made with lead times close to nine months. Now it appears that the predictions are frequently valid for up to a year in advance, and we can anticipate that information about rainfall and related atmospheric heating that will be supplied by the joint U.S./Japanese TRMM mission will provide the basis for a better understanding and prediction of the phenomenon called El Niño.

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