El Niño Is the Answer, But What Is the Question?

Gary D. Sharp
Center for Ocean Analysis & Prediction
Monterey, California

The issues at hand are that much of the ongoing climate modeling, and forecast capability is focused on producing consensus amongst modelers, rather than providing useful, locally or regionally verifiable (or falsifiable) process or forecast results such as upper ocean thermal structures, current strengths, local precipitation, extreme warm or cold periods, etc., which are the necessary information from which responses by agricultural or fisheries interests might be able to find alternatives to business as usual. The basis of the issue is the lack of accountabilities of the academic or Agency research programs, which tend to be self-serving, and apparently unconcerned with either commercial interests, or constituents beyond their own consensus groups.

Resource management, sans context, is a social travesty. Scientific research sans verification is usually a sign of extreme egotism, and irresponsibility. There are signs of progress in both arenas, yet it seems that using excuses about computer capacity, when lack of understanding is the main problem is a bit specious. It was only after nearly a decade of complaints that the subsurface ocean has begun to be include in climate modeling, as a forcing function, although even the novice physicist knows that the upper few meters of the ocean has much higher heat content, and therefore dramatic affect on climate, than does the entire atmosphere. Such dilemmas plague climate science. The most troubling of all is the fact that we are about nine thousand years into the next ice age, as recognized by every paleoclimatologist and geologist, yet the greatest "dread factor" that the climate modeling community can dream up to fuel their arguments for bigger and faster computers, while natural resources and critical habitats are being squandered from lack of environmental monitoring systems and credible management schemes. There does seem to be a mismatch between the necessary, and funding priorities.

Until there are appropriate in situ environmental monitoring devices distributed over the planet that there will be fortunes squandered on new space toys and rediscovering of wheels. The involvement of industry, on land, at sea, and in the air is a much more cost effective method for building and operating the necessary monitoring scheme than allowing government agencies and academia to continue leading themselves on merry chases over favored tracks. What is simply untenable is the continuance of the practice of deploying new technologies every few years, and turning off long-term data collection sites, simply because they have yet to produce the climatic equivalent of a cure for cancer. The entire era of satellite technology, combined together has collected more bytes of information than ever existed from all previous monitoring tools, yet nearly none of it has been organized and looked at, and that has been is not yet worthy of the label "climate data".

In fact, data sets encompassing less that several decades cannot be used to define or extrapolate even minor climatic trends. The value of a few well located high resolution varved sediment records and ice cores far exceeds the potential of the last decade's, or next decade's satellite information. that is not to say that these data are useless, only that we will need a century or more of observations before satellite information can be usefully interpreted in climatic terms. This fact is a consequence of the observations in high resolution (i.e., annual and decadal) geological and tree ring records that natural, pre- and post human local and regional climate changes commonly take place within a few decades, and that we are certainly recovering from a several century long global cold spell (the so-called Little Ice Age). Another interesting correlation within the context of the recent (mid-Holocene) millennia, since the warming melted the subpolar ice fields, is that civilization as we define it ensued at the time that the warm trend reversed, and that there has been a continuous global cooling, punctuated by short, several century warming respites, during which regional civilizations flourished.

El Niño is simply a microcosm of these longer-term issues. With the Droughts come the fires. With the rains come the grasses, rodents, disease, and then fires. What is different? On what time scale do societies respond to local crises? Regional Crises?, Global Crises? History books are full of descriptions, in which luxurious grasslands or agricultural valleys are colonized, exploited, depleted, and subsequently buried under human rubble. Within the recent several centuries we have experienced such phenomena even in the New World, And we have discovered that this has happened before, prior to the European invasion. These are likely all climatically motivated.

Typical of post warm period cooling trends have been complete breakdowns of regional agriculture due to water issues, over- population and over-exploitation of local resources, and eventually, during the post Medieval Warm period, not only the previously populous Asian continent and the Levant, but also Europe and the Americas experienced, famines, plagues, and assorted resource shifts and collapses that make up the history of the Age of capitalism, and present global commerce. Every few days or weeks we learn of another outbreak of human conflict, famine, or disease, now that people have literally saturated the habitable terrain. Marginal populations are the first to suffer, and eventually the large cities and populated regions will experience more than "climate change". More likely they will face the consequences of the learned science community's lack of responsible focus on real, immediate issues.

The global fresh water supply is far more critical than another climate research center, or another supercomputing breakthrough. Efforts to bring fundamentalist religions into the 21st Century, and limit both birth rate, and death rate are far more basic to the problems that loom than are another round of talks on the doom and gloom surrounding the recent century's rape of natural resources. Indeed, what is needed is a new means for collating what is known about climate issues, and water issues, and disseminating it throughout the world, so that some clever individuals from some already marginal societies might take the task at hand seriously. I am not sure that any solutions will, or even can arise from a western

culture whose daily energy and water consumption's exceed the local availabilities. Trading twenty thousand years worth of ground water, and thirty million years worth of hydrocarbon stores for a mere century's human comforts is simply not a sustainable option.

I would like to see the El Niño research community forget that it ever heard of El Niño, as a separate phenomenon, and get on with the issue of tracking all the subtleties of global hydrosphere dynamics, from the upper 200 meters of the ocean, into the atmosphere, and into generally higher latitudes, and eastward. Representation of the longer- term hydrologic consequences of each ENSO phases, warm or cool, will pay off, particularly if these activities focus on identification of transient ecological forcing functions, rather than solely on the physics of the processes. I am already able to understand with sufficient security what the ecological consequences of another Kelvin wave from the mid Pacific Ocean will do to coastal fisheries, and coastal agriculture to accept that while anchovies might be rarer for a year or so, that the grape crops will flourish, providing far more economic benefits than fisheries along the west coast of the Americas.

Similarly, the long droughts associated with High ENSO conditions cause incredible hardships in the Australian and Indonesian environments, followed by heavy rains and severe fires as the ENSO phases shifts. What would society do if they were able to know three months in advance? One year in advance? three years in advance? Probably not a lot more that is already done. Bet on the come, as they say. In a few cases, such as Peru, rainfall is only associated with the ENSO warm phases, and its accompanying lingering ITCZ activity. Yet the cool ENSO phase stimulates intense transport of latent heat from the eastern tropical Pacific northeastward, across Central America and Mexico, to form deluges along the Texas and Plains states, depending upon the prior heat contents of the Gulf of Mexico, and the status of the polar air masses as they sweep eastward, dipping down into the Plains, under the influence of strong forcing from the Northeast Pacific Ocean.

Can we really forecast the consequences of an ENSO phase without a simultaneous grasp of the North Pacific patterns and their precursors and consequences. From statistics, only with several centuries of observations. From climate models, only once the entire heat budget of the planet is understood, incorporated, and measured from source to sink. What is the likelihood of this occurring within the next decade? I would suggest that it is no more likely than man will be living on the moon - for about the same reasons. There are not enough people that would benefit directly from such forecasts, simply because there are not always appropriate options to be taken, given that the crops in North America are mostly already in by the onset of El Niño rainfalls, and that the winners and losers in these environments tend to be living in marginal areas to begin with. They have already made the wrong decision, if they are living within the flood plain of a river, or on the sandy beach off the eastern seaboard. The question is really who will pick up the bill once the inevitable occurs?

Bill Gray has discovered that if you have a home in Charleston, Miami, or any stretch of the Gulf of Mexico, you pray for El Niño. If you live in Bahia Tonggoy, or any of the

other isolated bays of northwestern South America, you can expect a surplus of valuable scallops, in stead of the conventional seaweed crop. The folks living in the river beds of Ecuador and Peru during the 1972 and 1983 Niños were living in marginal locations, too. Similarly, sheep ranchers in the outback of northern Australia choose their living, and risk semi-frequent devastating losses. Is this the fault of ENSO, the most frequent climatic phenomenon amongst an array that stretches from decades to hundreds of thousands of years. Do we ignore the last 400,000 years information, and the telling high resolution data sets that one can match up with historical records of local and regional climate consequences, some good, some bad?

In the case of ocean fisheries, I am confident that we can now do as much planning, and responding ahead as is needed, given the existing three months or more monitoring lead that we now can obtain. The real issues are not so much forecasting ENSO events, as getting a better grip on rational resource management, by eliminating the existing overcapitalization, and reorganizing the global fishing power to take advantage of local and regional blooms, ,and recessions, rather than blaming failed fisheries on climate processes. There are actions that could and should be taken to protect impacted aquatic resources, but existing management systems are not proactive, and fraught with political pressures which inhibits realistic resource management. Like the climate modeling community, resource management needs to reassess its priorities, and responsibilities.