Example of southern oscillation index report

Environment, Animals

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The Southern Oscillation Index (SOI)

Ausloos and Ivanova (2001, p. 1) succinctly define the Southern Oscillation Index (SOI) as a core component or characteristic of the El Nino phenomenon. The SOI data have been collected and analyzed since the year 1866 so as to effectively study and explain the occurrence of extreme climactic events. This makes it possible for meteorologists to understand the outstanding factors of the sometimes catastrophic phenomenon of El Nino and therefore be able to estimate and accurately predict future trends.

In essence, the core aspects of the SOI are derived from studying the cyclical warming and cooling of localized regions within the Pacific Ocean as analyzed along with distinct sea level pressures. These localized regions are Darwin and Tahiti and they constitute the eastern and central regions of the Pacific Ocean under survey to calculate the SOI number. When the SOI

number is negative, there is ocean cooling which constitutes an El Nino. Similarly, when the number is positive, there is the opposite effect of ocean warming which constitutes a La Nina.

Climactic Effects of the SOI

Previous research (Kiem & Franks 2004, p. 2039) indicates a clear link between the SOI and climactic changes in the Pacific region including Australia and its neighbors. These studies show clear variations in the modulation and magnitude of the impacts of the SOI on rainfall and stream flows, especially in Australia, across several decadal time-scales. These El Nino and La Nina phases of the SOI are especially significant to the flow of streams in the southeastern regions of Australia such as New South Wales (NSW). They thus have marked effects on the amount of surface water available at any given time. As such, there are close relationships between the ISO and drought risk in these areas.

For instance, according to Kiem and Franks (2004, p. 2042), the water level at the Grahamstown Reservoir in New South Wales is seen to fall below the critical 30% point during the positive phase of the SOI. This reservoir is an accurate representation of the water-level situation in the southeastern region of Australia as it is primarily independent of surface run off for its water. Such key fluctuations in the water levels due to the SOI are part of the climatic changes within the region; they are also indicative of other equally significant changes outside of the climate, which are observed to be direct results of climatic variations.

The SOI does not just affect rainfall and water levels as part of its impact on climate. Other researchers (Drosdowsky 2005, p. 1297) also point out clear links between the SOI and other core elements of climate as barometric pressure. More precisely, the SOI is seen to affect the subtropical ridge over eastern Australia, which is basically a region of high pressure and is therefore of key significance to meteorologists. During the El Nino and La Nina events of the SOI, the ridge is noted to significantly oscillate between its weak and strong points in correspondence to the changing SOI phases. Similarly, it is also seen to shift further towards the equators and then towards the poles correspondingly.

Effects of the SOI on Biodiversity

The most glaring effects of the SOI according to Letnic and Dickman (2006, p. 3847) are on biodiversity. They describe precise correlations between the SOI and the shifting behavioral patterns of the inhabitants of east and central Australia. For instance, anthropological data collected over time indicates a marked shift in land tenure from the economy of hunting and gathering to pastoralism within a span of slightly more than 150 years. Species have also been lost due to climate changes and subsequent changes in the environmental factors essential for the survival of biodiversity.

Rainfall

Shifts in rainfall patterns as discussed above are especially responsible for the more radical changes in environmental factors. According to Letnic and Dickman (2006, p. 3858), the wet and dry seasons in the east and central regions of Australia correspond directly to the El Nino and La Nina phases of

the SOI. In essence, during the positive La Nina phase of the SOI, the regions receive above average rainfall as compared to the negative El Nino phase when the rainfall is low. Given these climactic changes, variations in the amount of rain received in a particular region owing to the different phases of the SOI affect the availability of vegetation, which is at the primal end of the ecological system. This then influences the migratory and behavioral patterns of higher animals (Letnic, Tamayo and Dickman 2005, p. 697).

Wildfire

As indicated in their 2006 study, Letnic and Dickman (2006, p. 3861) found that the fire regimes of the central and eastern regions in Australia are correlated with the shifts between El Nino and La Nina phases of the SOI. This is mostly as a consequence of alternations between times of high and low rainfall as combined with the effects of extreme weather patterns such as occasioned by lightening. These fires do not necessarily affect large areas whenever they happen but they are seen to affect the behavioral patterns of people and animals within the affected regions. Nevertheless, some of these fires have also extended across considerably vast areas with significant effects on the affected regions with regard to both vegetation and wildlife. The most significant effect of these extensive wildfires has been the complete loss of vegetation which in turn impacts negatively on the people and animals that depend on them.

Population Dynamics

As indicated above, shifts in rainfall affects the availability of vegetation on which people and animals can feed. Similarly, wildfires have the effect of

sometimes wiping out extant vegetation thus leaving little or no food for people and animals across the affected regions. According to Letnic, Tamayo and Dickman (2005, p. 698), high rainfall in the central and eastern regions of Australia as occasioned by the positive La Nina phase of the SOI are precursors to explosions in the population of small animals accompanied with the concomitant increase in the population of their respective predators. Similarly, animal populations are noted to increase in areas with little negative effects of wildfire with animals generally preferring to inhabit only those areas left unburned to (Letnic, Tamayo & Dickman 2005, p. 700).

Socio-economic Effects of the SOI

Miles et al. (2004, p. 15) have conducted extensive research into the socio-economic effects of climate change in Australia as occasioned by the oscillatory events of the SOI. When the SOI number is positive and thus in the La Nina phase, the Pacific trade winds are stronger which then translates to warmer sea temperatures for Australia. This is then followed by the opposite negative El Nino phase of the SOI which leads to a climactic cycle that ultimately results in the oscillation between warm and cool temperature, as well as the increase and decrease of rainfall. For instance, these shifts between two climactic extremes largely affect the Great Barrier Reef in the northeastern coast of Australia. These effects, just like their extreme causes, are also positive and negative in nature; they thus affected the socio-economic activities associated with the reef.

The aforementioned socio-economic effects of coral bleaching as a result of the SOI pluvial phases are essentially twofold: fishing and tourism. In

essence, the Great Barrier Reef is home to a wide variety of marine life, most of which provides local and outside communities with fishing opportunities. This means that the correlation between coral organisms and fish is significant with regard to the commercial exploitation of the latter (Miles et al. 2004, p. 53). If the number of available fish for harvesting dips due to coral bleaching, then it only follows that commercial fishing will be negatively affected and is thus gravely detrimental.

According to Miles et al. (2004, p. 49), the biodiversity in the Great Barrier Reef is also especially critical to both recreation and recreational fishing in the northeastern coast of Australia; this is a core component of tourism activities around the area. This also effectively means that any reduction in the marine life within the reef due to coral bleaching is detrimental to these activities. This includes even the rare and exotic forms of marine life found deep within the region, which is inarguably the main attraction of divers in the area.

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