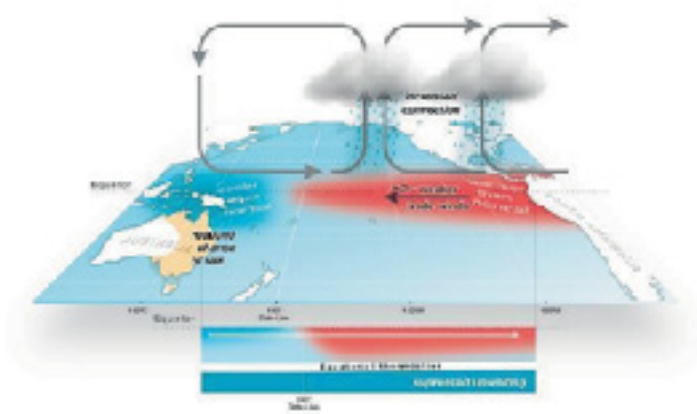


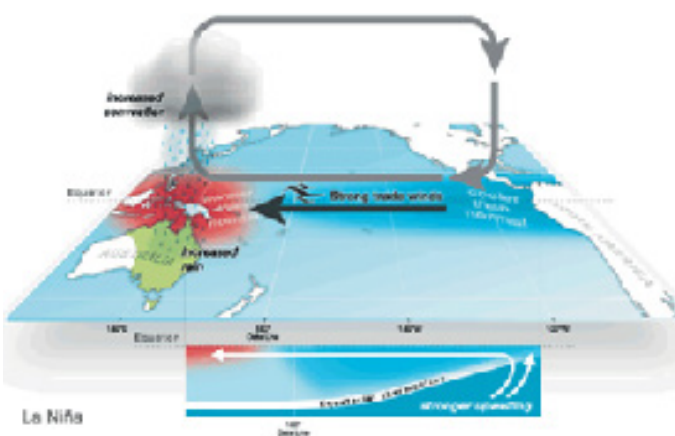
# Climate drivers that affect South Eastern Australia

**ENSO – (El Niño Southern Oscillation)** refers to sources of rain bearing moisture that comes from the tropical Pacific Ocean. Historically El Niño years send us less moisture, increasing the chance of drier springs. La Niña years (like 2010) send us more moisture and eastern Australia tends to have increased chances of average or wetter springs. Farmers can track what ENSO is up to see what the outlook is for each spring – June-August is a good time to look at how things are set up for spring rainfall. The SOI (Southern Oscillation Index) is a measure of the pressure difference between Darwin and Tahiti. In El Niño years, the pressure is higher over the Darwin/Australia region and lower at Tahiti in the Pacific (SOI negative), which is not helpful for the flow of tropical moisture towards Australia. Recent events/seasons include El Niño (2015, 2009, 2006, 2002, 1997, 1994) and La Niña (2011, 2010, 2007, 2000, 1999, 1998).



During the El Niño phase warm waters head towards South America and trade winds are weakened. This results in less atmospheric moisture available for rain in Australia. In the past, El Niño years have been correlated with an increased chance of drier springs.

Images: Courtesy of BoM



Historically, La Niña years deliver more moisture to Australia, because warm waters gather closer to our north coast.

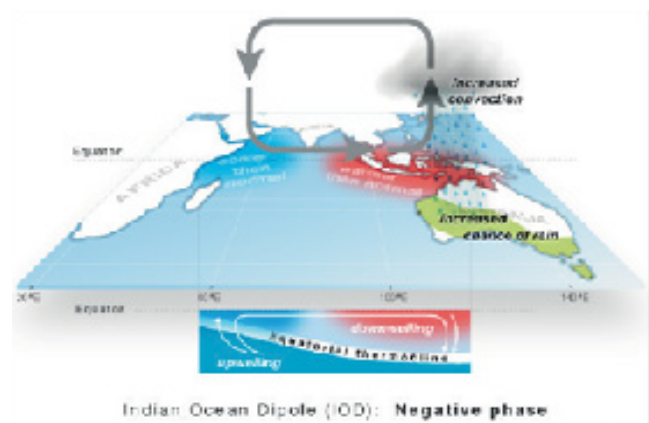
Combined with increasing trade winds this provides more moisture in the atmosphere and directs it towards eastern Australia. In the past, La Niña years have been correlated with an increased chance of wetter springs.

Images: Courtesy of BoM

**IOD – (Indian Ocean Dipole)** refers to the supportive role played by the Indian Ocean and northwest cloud-bands and triggers coming from the tropical Indian Ocean region off the coast of northwest Australia. For much of the South East region, spring rainfall shows a strong correlation with drier years when IOD is in the drier phase (positive IOD). Wetter springs are more likely during negative IOD phases, when extra moisture flows and rainfall triggers get sent down to us via northwest cloud bands which drop out their moisture when they hit our cold air down south. Recent events/seasons include IOD positive/drier (2019, 2015, 2012, 2011, 2006, 2004, 1997, 1994) and IOD negative/wetter (2016, 2010, 1992).

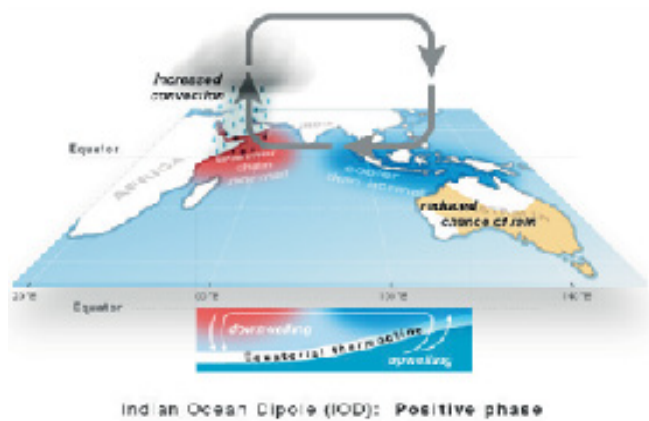
When the Indian Ocean is warmer in the east than it is in the west, we have a negative IOD event. This means that more moisture is available closer to Australia and can be delivered to SE Australia through northwest cloud bands.

Typically, negative IOD events have been associated with wetter seasons in SE Australia.



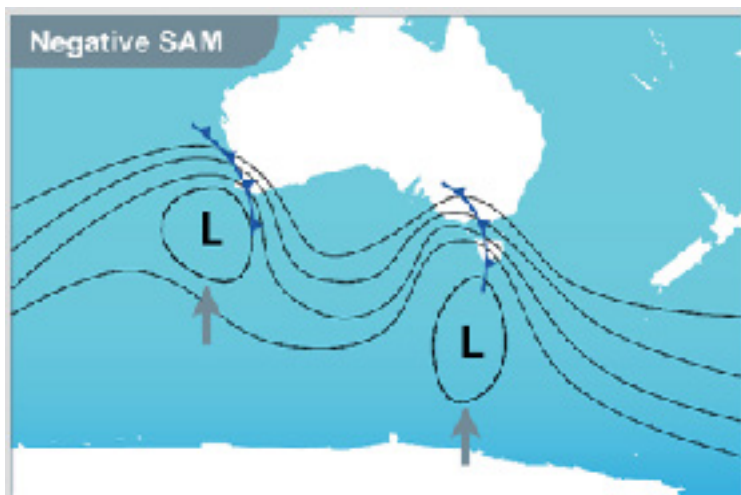
Images: Courtesy of BoM

A positive IOD occurs when the Indian Ocean is warmer in the west (near the coast of Kenya) than it is in the east (near Sumatra). This reduces tropical moisture availability for SE Australia and can make for a drier winter/spring.



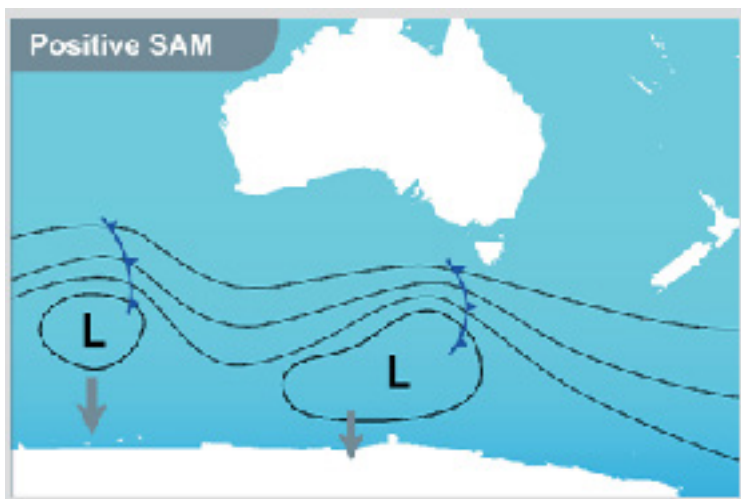
Images: Courtesy of BoM

**SAM – (Southern Annular Mode)** refers to belts of westerly winds that circulate around the Southern Ocean and can influence the strength of frontal activity and rain triggers that get to the South East region. More regular or stronger fronts lead to wetter winters. When SAM is in a positive phase, fronts sit a lot further poleward, which can lead to drier winters. However, in summer the same SAM positive phase can assist with summer rainfall events along eastern parts of Victoria and southern NSW. In recent decades SAM has spent more time further south which partly explains reduced winter rainfall in parts of South East region.



When the westerly wind belt expands, more (or stronger) fronts can come closer to southern Australia. Negative SAM increases the likelihood of above average winter rainfall in SE Australia.

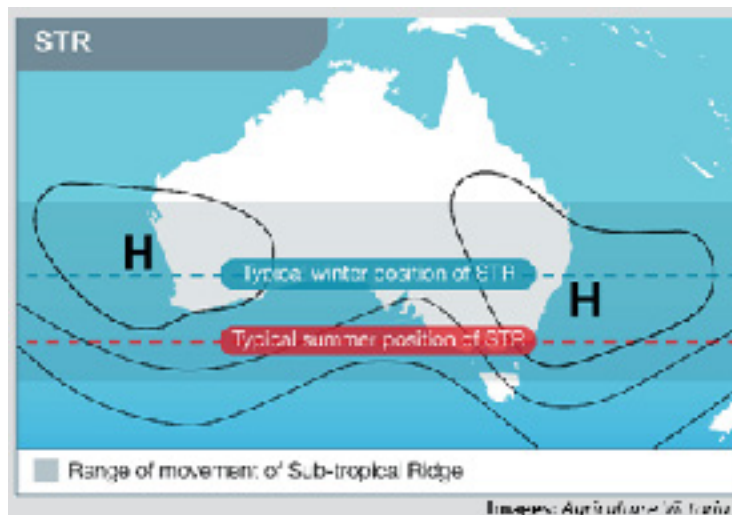
*Images: Agriculture Victoria*



When the belt of westerly winds contracts around Antarctica less (or weaker) rain producing fronts move across southern Australia. This is called the positive SAM phase and decreases the chance of rainfall (from fronts) during winter.

*Images: Agriculture Victoria*

**STR – (Sub-Tropical Ridge)** is a natural high-pressure belt that sits across southern parts of Australia and can influence the location and strength of high-pressure systems. Farmers know that seasons with stronger or more frequent blocking high pressure systems over southeast Australia don't tend to produce the regular rainfall that we would like. In recent decades the pressure pattern during the growing season has been measured as being a bit stronger, which meteorologists blame for the less reliable autumns rains in parts of southeast Australia. It also sets up the weather pattern that can bring cold/dry air from near Antarctica over parts of our region which can increase the incidence of frosts.



Typically, in winter the STR moves north, allowing fronts to pass over southern Australia. In summer, the STR typically moves south, blocking the passage of fronts which is part of the reason why SE Australia experiences rain bearing cold fronts during winter. The strength of the high-pressure systems also affect rainfall. Higher pressure means less rainfall.

**Did you know that:**

The wet spring and end to 2010 was wetter due to both ENSO (strong La Niña) and IOD (negative IOD = wetter) sending more moisture down this way.

The 2006 drought was the result of a combination of ENSO (El Niño - drier) and IOD (positive IOD = drier). The bigger droughts often occur when both are in their dry phase.

The 2015 dry spring was also the result of ENSO (El Niño - drier) and positive IOD (drier) teaming up again at their drier end of the scale.

The wetter 2016 winter spring was thanks to a negative phase (negative IOD = wetter) of the Indian Ocean Dipole, which helped herd extra moisture to the South East region via northwest cloud bands.