**ATM306 Mid-Term October 15th Answer all four questions**

**Question 1**

1. State briefly why we expect there to be more rainfall in the tropics than in midlatitudes.

 **(4 marks)**

1. State briefly why the annual cycle of the surface temperature of the tropical land is more pronounced than the annual cycle of the surface temperature of the tropical ocean.

 **(4 marks)**

1. If we cannot predict the weather more than about a week ahead, discuss briefly why we are able to predict the climate more than a season in advance.

 **(10 marks)**

**TOTAL: 18 marks**

**Question 2**

1. Provide a description of the El Nino state. Include in your answer a sketch and a brief description of the following anomalies:

* Sea surface temperatures
* Rainfall
* Surface pressure
* Low-level zonal winds
* Thermocline depth

 **(10 marks)**

1. State briefly what is meant by the “Bjerknes feedback” and show how this can explain the growth of El Nino.

 **(8 marks)**

**TOTAL: 18 marks**

**Question 3**

1. Describe briefly, in the context of the delayed oscillator theory, how equatorial waves can be forced by zonal wind anomalies on the equator.

 **(6 marks)**

1. Explain using appropriate sketches when appropriate how the delayed oscillator theory explains why we expect El Nino events to be followed by La Nina events.

 **(12 marks)**

**TOTAL: 18 marks**

**Question 4**

State whether you think the following statements are true or false and give a reason why. One mark is given for a correct true or false answer and 2 marks are given for the correct explanation.

1. The reason that the delayed oscillator theory predicts a faster evolution for ENSO than observed is because it does not include midlatitudes.
2. The east-west gradient in sea-level height is flatter in El Nino years than in La Nina years.
3. To monitor the likelihood of an El Nino event occurring in the coming months it is important to observe the characteristics of the ocean beneath the surface.
4. An atmospheric model of the Pacific could be used to make skillful predictions of the likelihood of an El Nino event occurring in the next year.

**TOTAL: 12 marks**