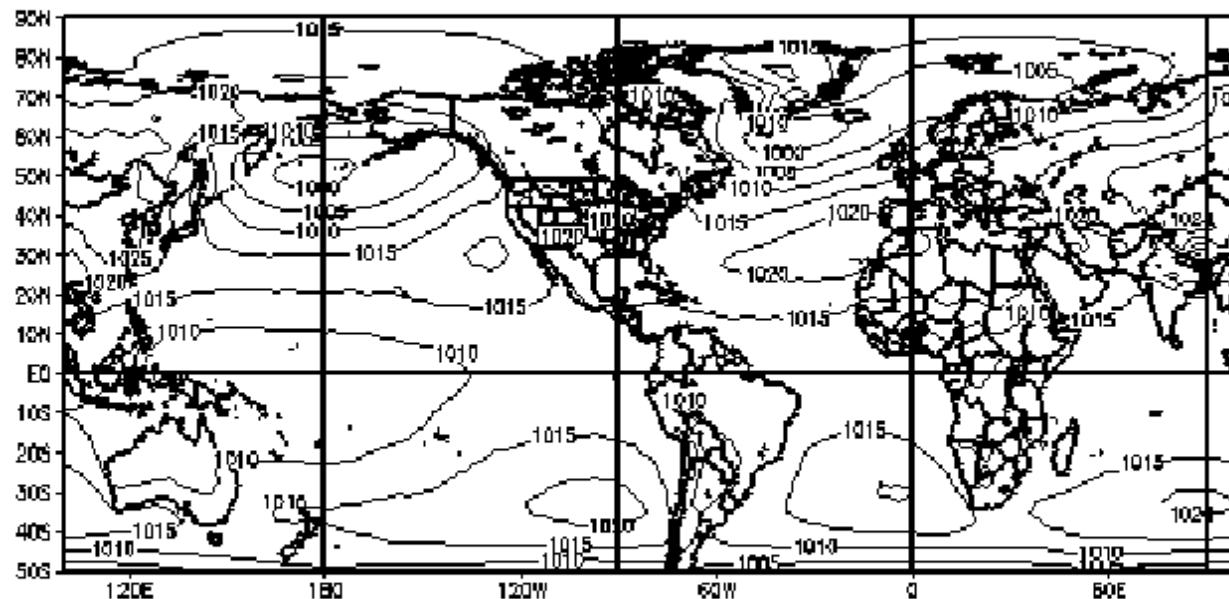


**Responses of the Atmospheric Centers of Action to the Solar Cycle in  
the East and West phases of the Quasi-Biennial Oscillation.**

**Sultan Hameed and Jae N. Lee  
Institute for Terrestrial and Planetary Atmospheres  
Stony Brook University**

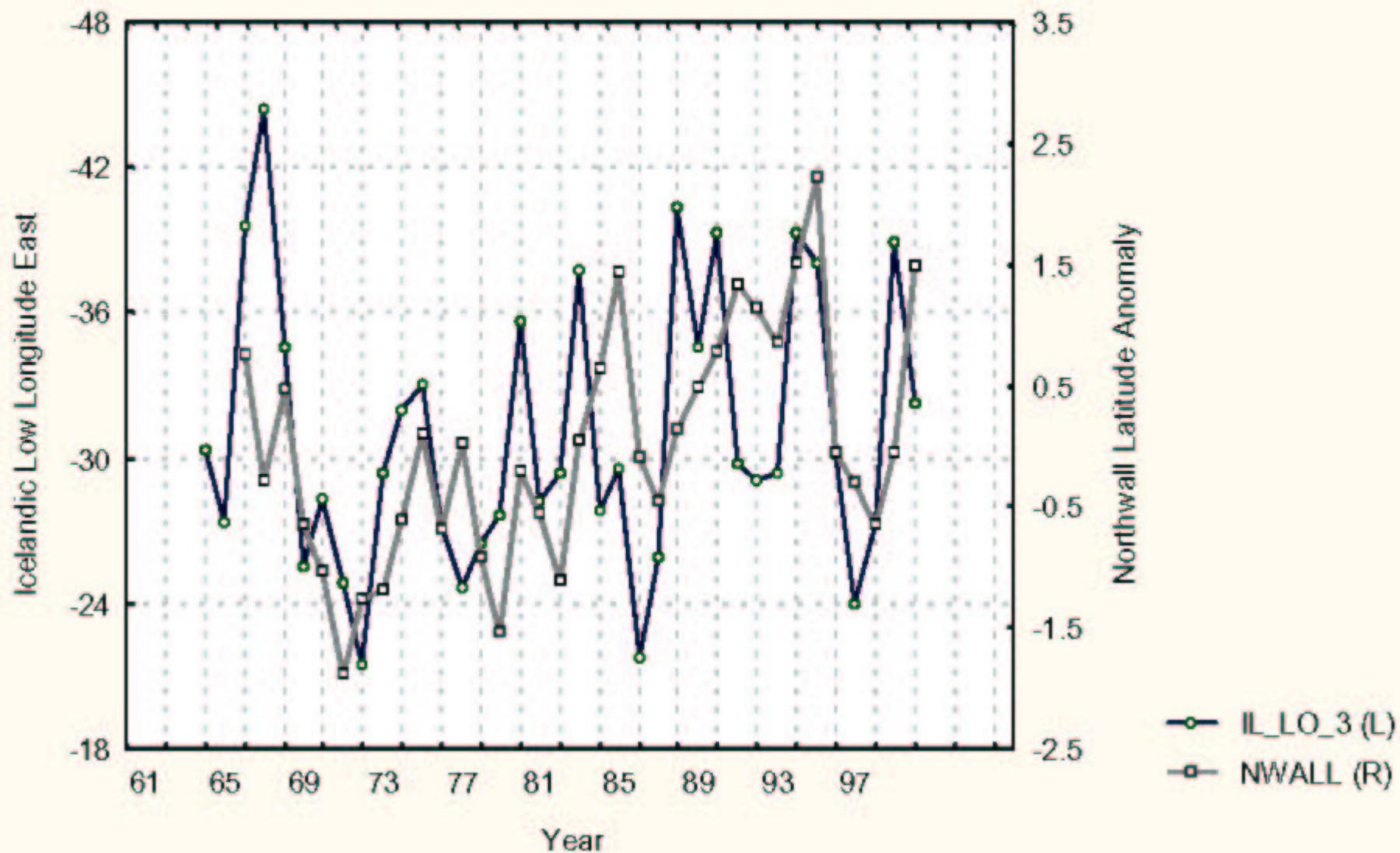
**This work is supported by NASA's Living with a Star program**



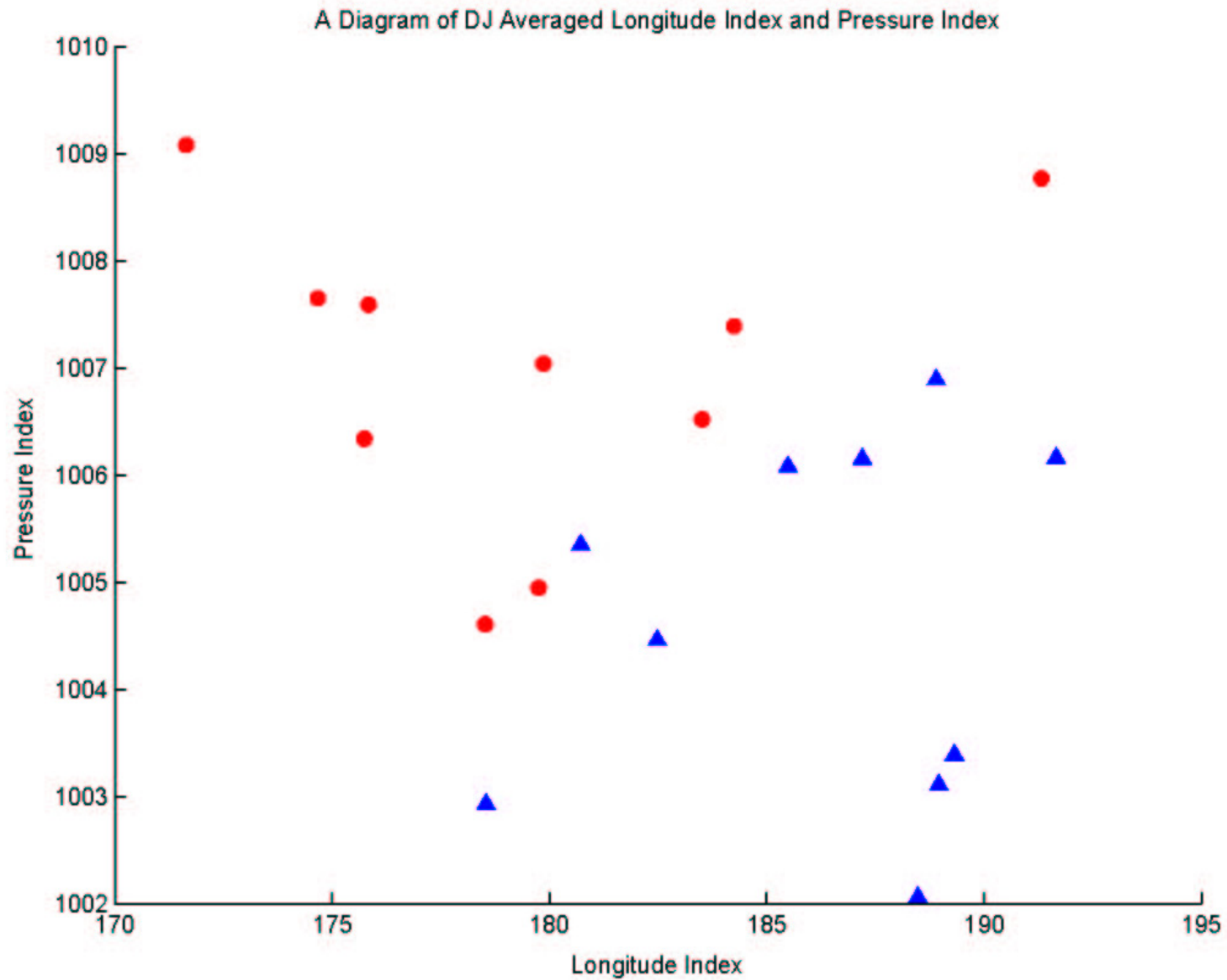


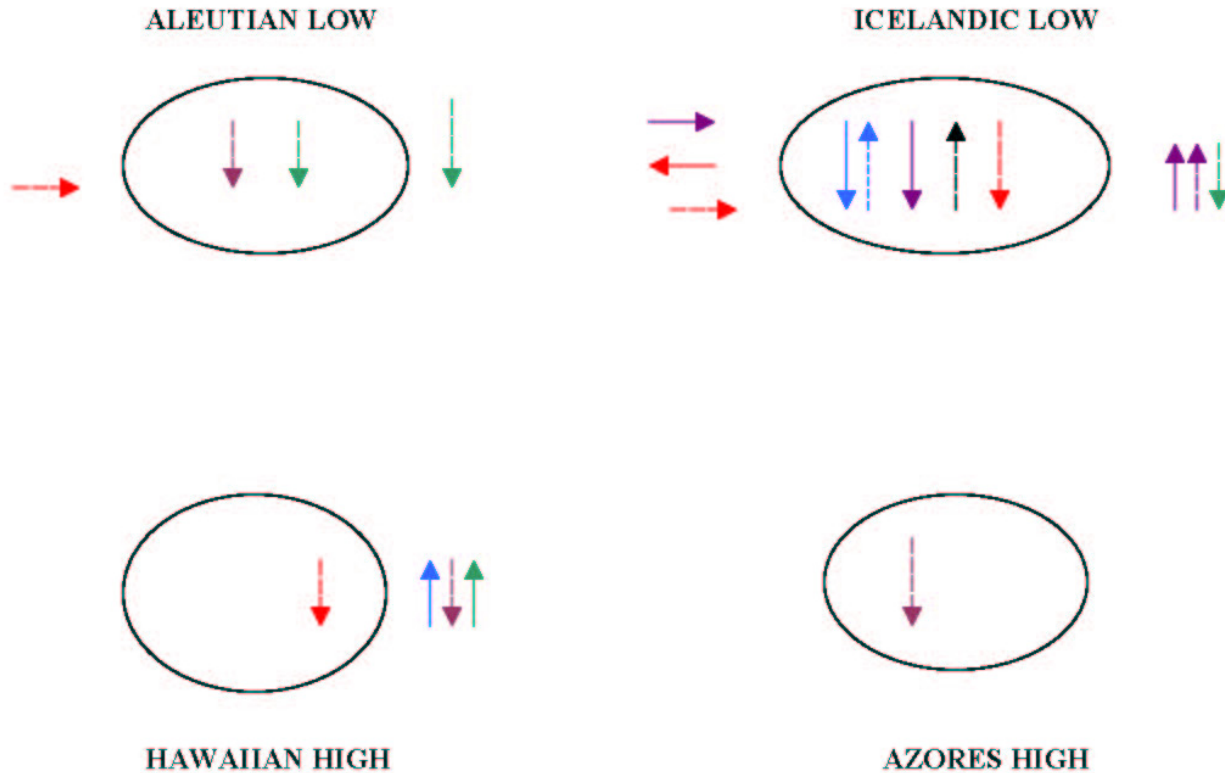
Sea Level Pressure (mb) Long-term Mean  
 Dec to Feb: 58-96 LTM  
 NCEP/NCAR Reanalysis

Gulfstream Northwall and the Icelandic Low Longitude Position Lagged 3 Years



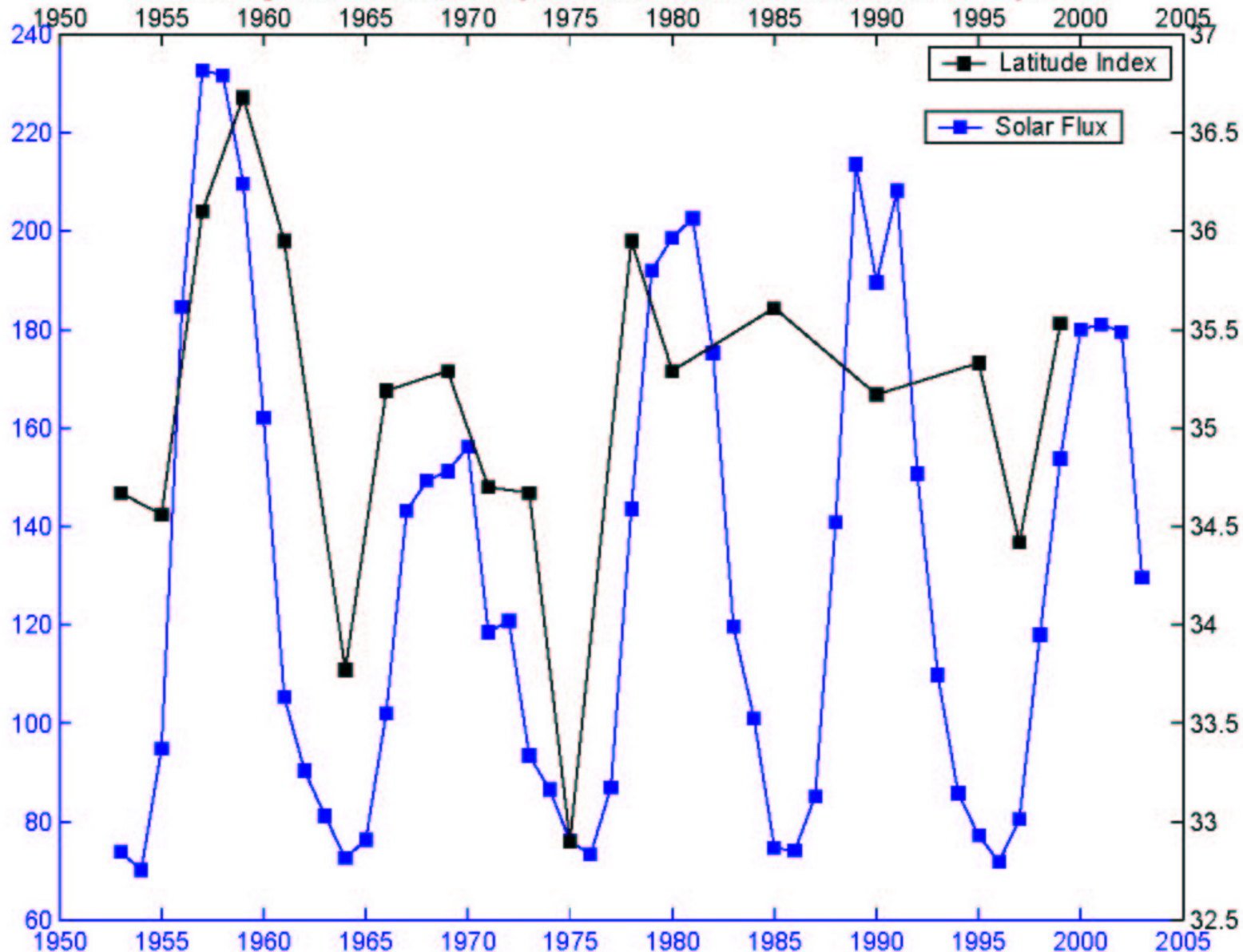
# The Surface Pressure and Longitude Position of the Aleutian Low at Solar Maxima (Red) and Minima (Blue) since 1900



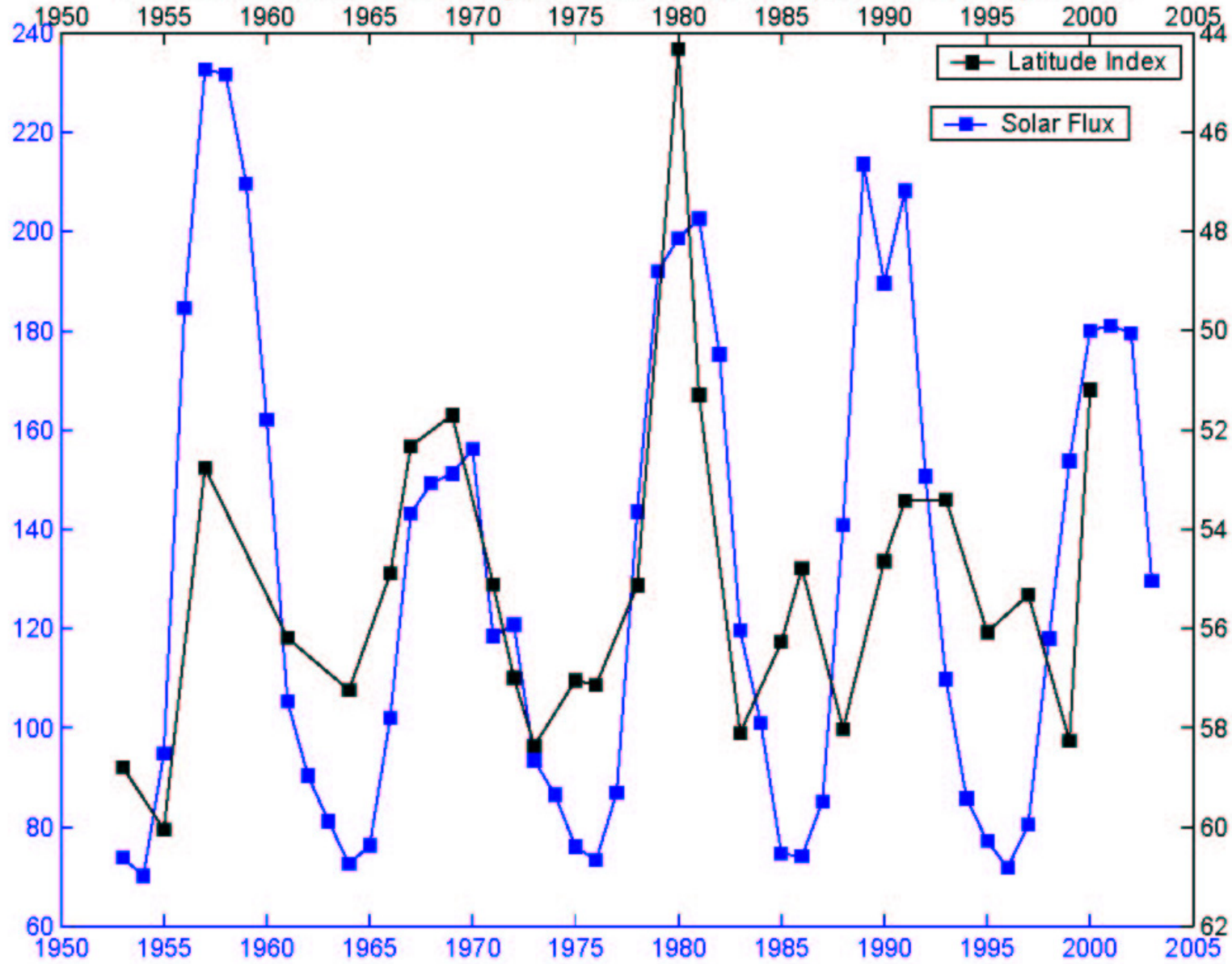


Significant correlations over the 1950-2002 period are shown by solid arrows for the East phase of the QBO and by dashed arrows for the West phase. Arrows inside the Center of Action indicate correlations of its surface pressure with the solar cycle. Vertical arrows to the right of the COA represent correlations of its latitude position and horizontal arrows to the left represent correlations of its longitude position. Blue represents Winter, Brown represents Spring, Green represents Summer and Red is Autumn.

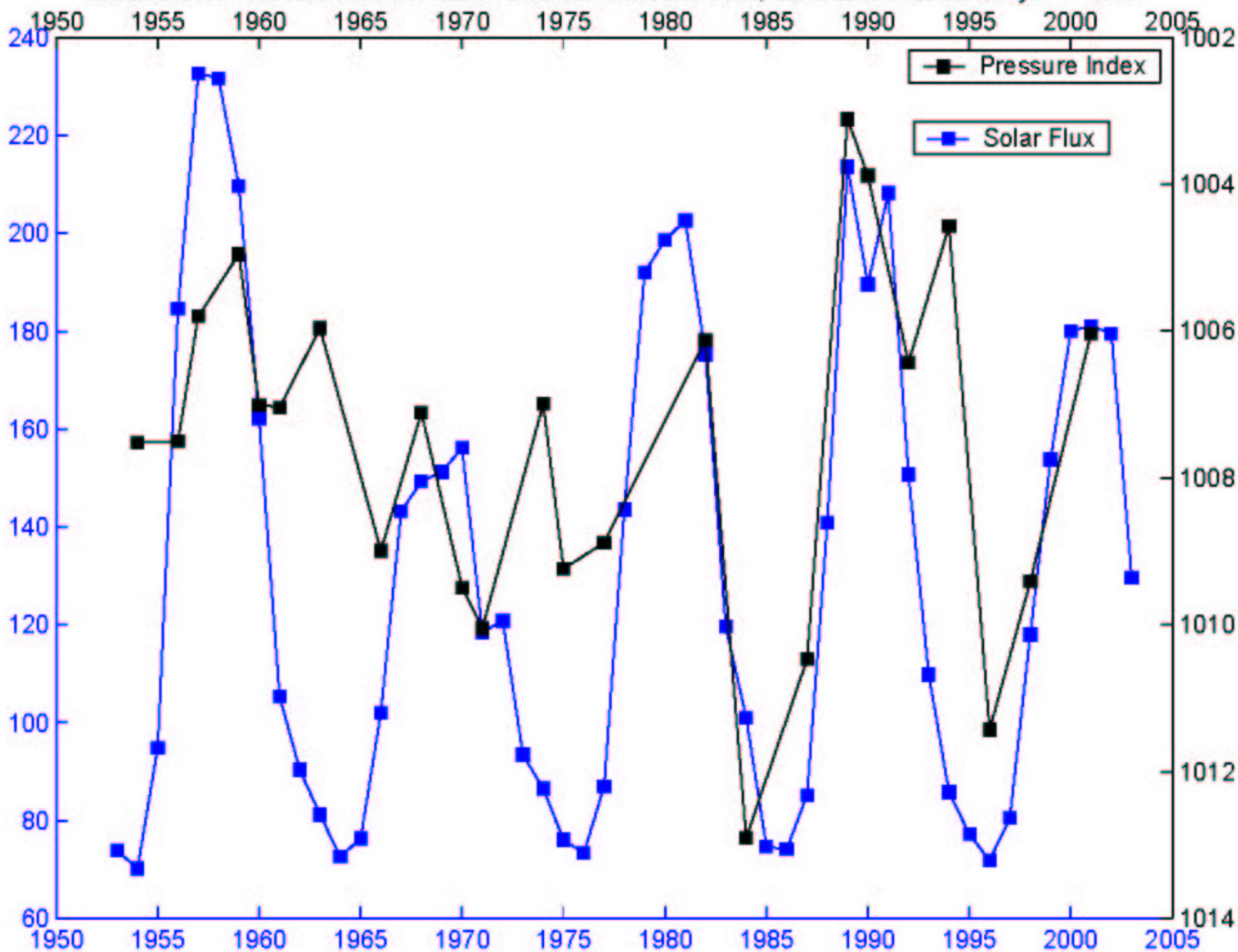
Hawaiian High Latitude Index of July and 10.7cm Solar Flux; QBO WEST for July;  $r=0.63$



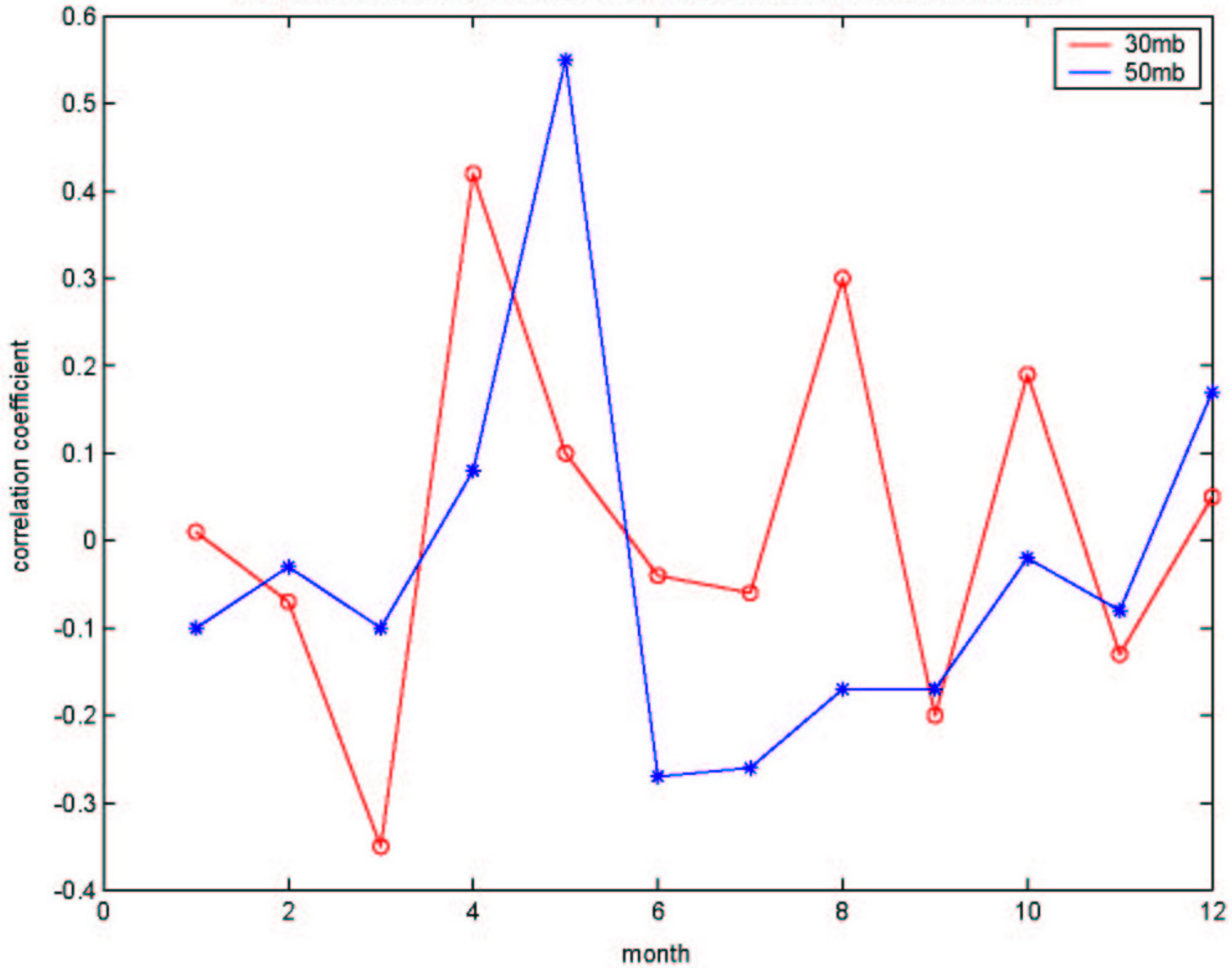
Aleutian Low Latitude Index of August and 10.7cm Solar Flux; QBO WEST for April:  $r = -.63$



Iceland Low Pressure Index of March and 10.7cm Solar Flux; QBO EAST for January:  $r = -0.57$



Correlation between 10.7cm solar flux and Icelandic Low latitude:QBO WEST



# Summary

- The surface pressures and the positions of the Aleutian Low, the Icelandic Low, the Hawaiian High and the Azores High systems have significant correlations with the solar cycle when they are classified by the East and West phases of the QBO.
- The correlations with solar cycle are observed during the summer in the West phase of the QBO.
- The correlations are observed up to four months after the QBO condition in the stratosphere.
- Correlations at the surface can be observed earlier when winds at 30 mb are used to identify the QBO phase in comparison with winds at the 50 mb level.