

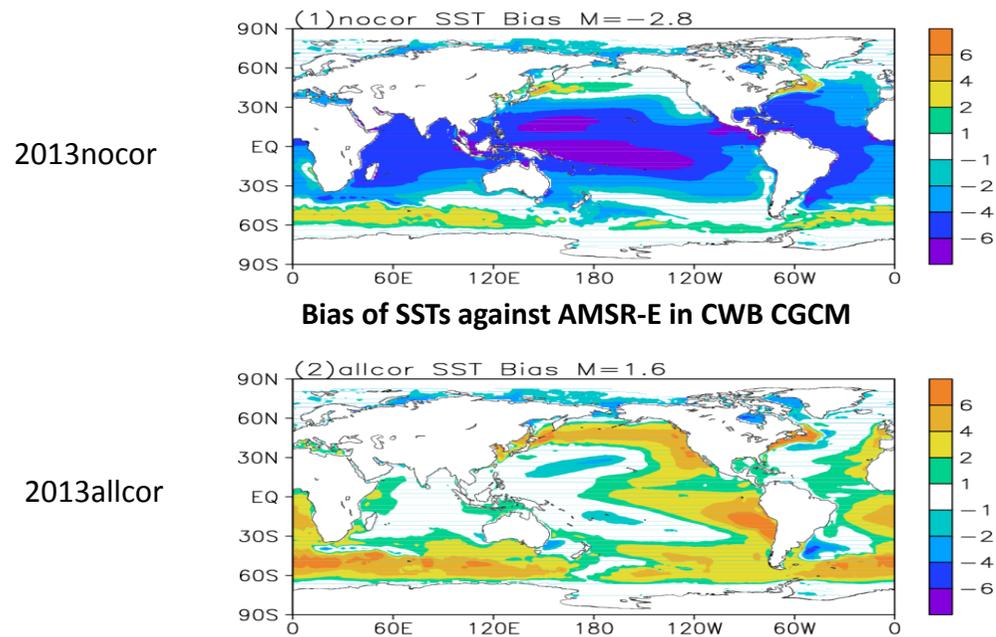
CWB CFS 1-tier 模式雲物理過程之改進結果

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講員:吳子榆

CWB 1-tier CFS 介紹

- 目前正在發展中的CWB CFS 1-tier模式，包含CWB大氣模式與GFDL MOM3海洋模式，為海氣耦合模式(T119L40)。
- 去年主要利用統計NCEP大氣模式與CWB大氣模式30年積分平均之輻射通量的比值，對傳輸到海洋模式的大氣輻射通量進行調整。進行兩組實驗，一組沒有做輻射通量調整稱為2013nocor，一組有做輻射通量調整稱為2013allcor。實驗結果發現，2013nocor的海溫存在冷偏差，約6K；2013allcor的海溫存在暖偏差。



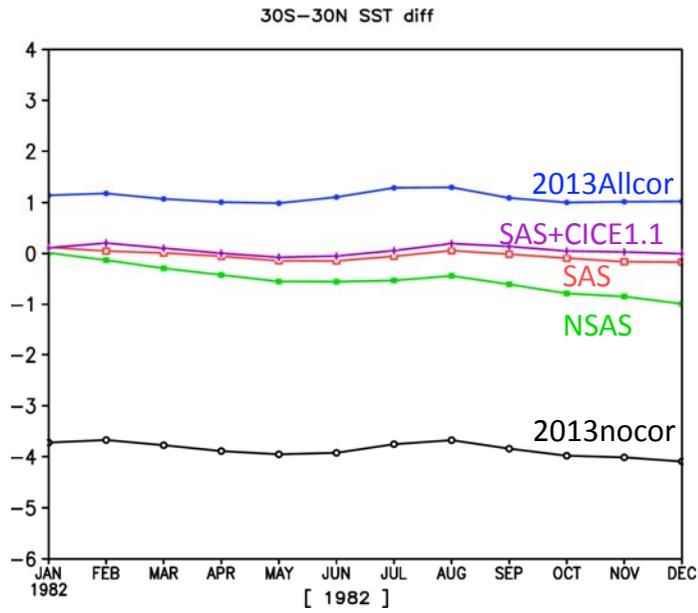
- 並對其他氣象變數場分析，發現對傳輸到海洋模式的輻射通量進行調整，海洋模式反饋到大氣模式作用非常小，對大氣模式是沒有幫助的。
- 希望透過對大氣模式雲物理過程調整，改善大氣模式結果，並改善海溫存在的負偏差。

實驗組別介紹

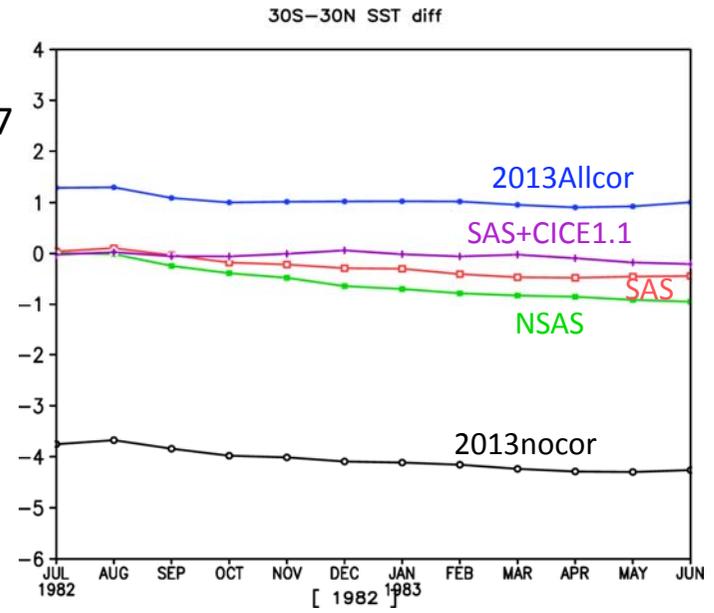
測試項目	目的
地表反照度調小	讓更多的短波輻射達到地表，而使海溫增加。
PBL通量變小	將Von Karman constant由0.4改為0.3，減少PBL通量
增加雲量	希望進到地表的短波輻射減少，且減少向上的長波輻射
考慮冰水路徑(IWP, ice water path)	想要知道雲冰對輻射的影響
Convection scheme改為SAS (Simplified Arakawa and Schubert)	透過Convection scheme改變雲的生成
Convection scheme改為NSAS (New Simplified Arakawa and Schubert)	透過Convection scheme改變雲的生成

實驗結果-海溫

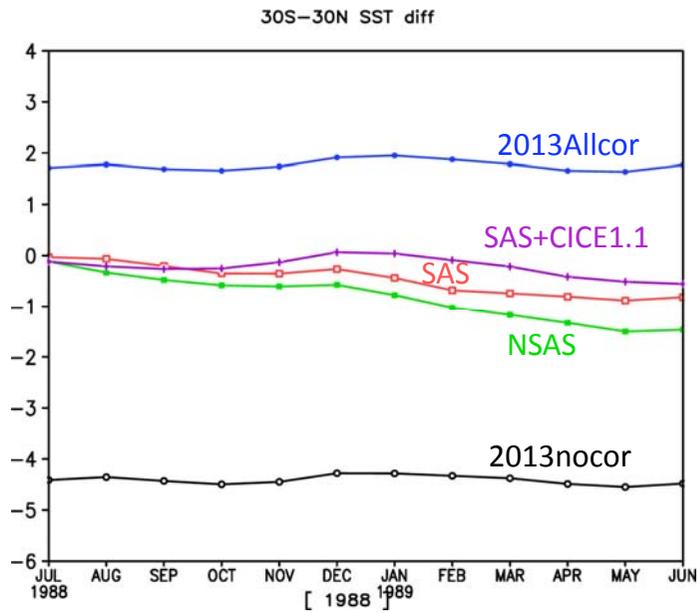
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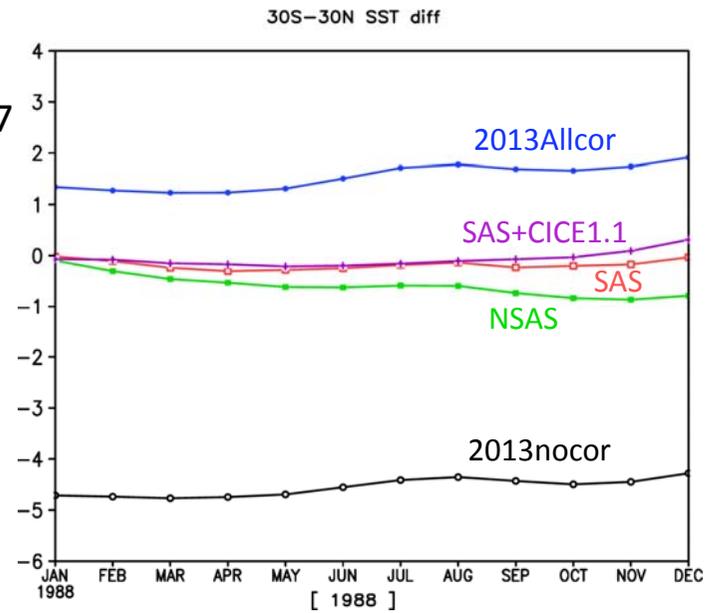
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198801



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聖嬰年份列表

Weak (with a 0.5 to 0.9 SST anomaly), Moderate (1.0 to 1.4) and Strong (≥ 1.5) events

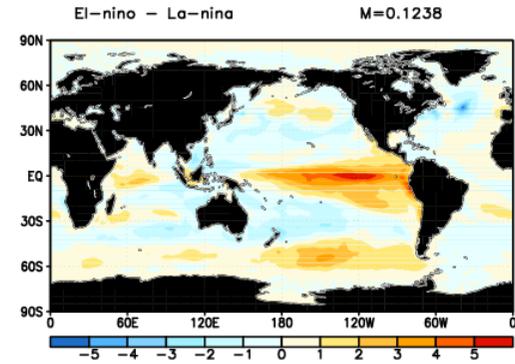
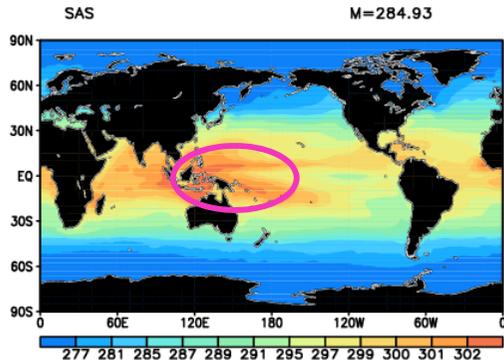
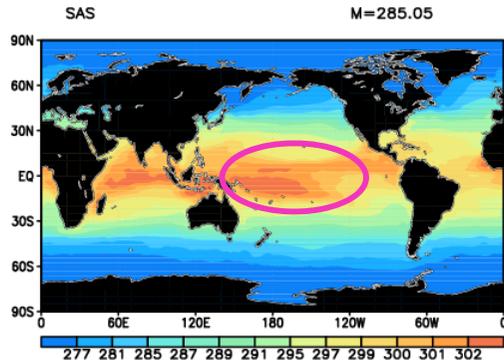
	El Ni no			La Ni na		
	Weak	Mod	Strong	Weak	Mod	Strong
	1952-53	1951-52	1957-58	1950-51	1955-56	1973-74
	1953-54	1963-64	1965-66	1954-55	1970-71	1975-76
	1958-59	1968-69	1972-73	1956-57	1998-99	1988-89
	1969-70	1986-87	1982-83	1964-65	2007-08	1999-00
	1976-77	1991-92	1987-88	1971-72		2010-11
	1977-78	1994-95	1997-98	1974-75		
	2004-05	2002-03		1983-84		
	2006-07	2009-10		1984-85		
				1995-96		
				2000-01		
				2005-06		
				2008-09		
				2011-12		

Dec 1982(El-nino)

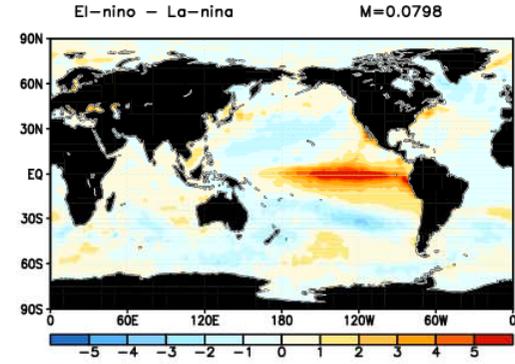
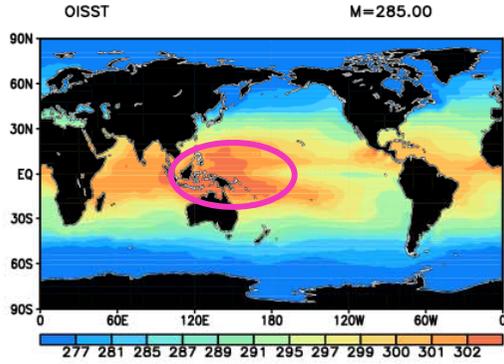
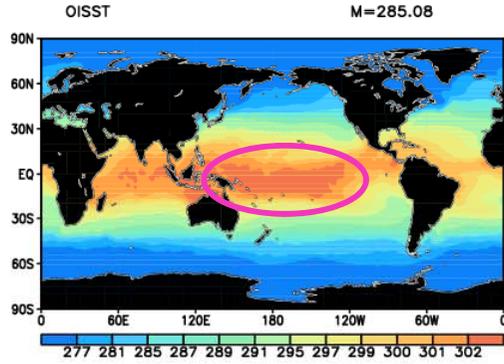
Dec 1988(La-nina)

El-nino - La-nina

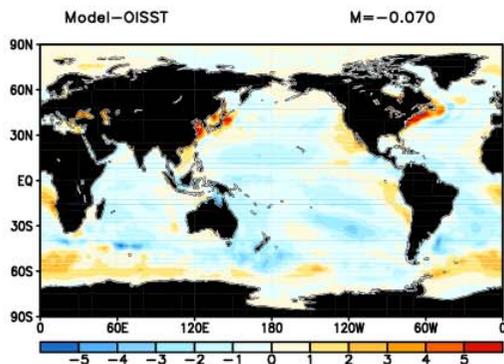
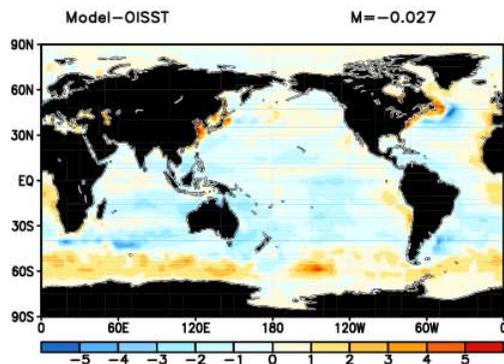
SAS



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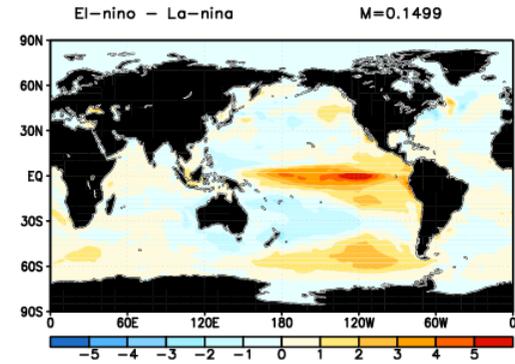
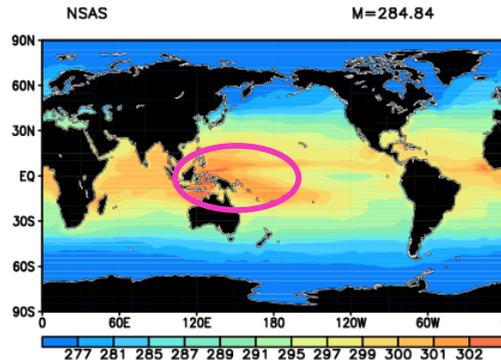
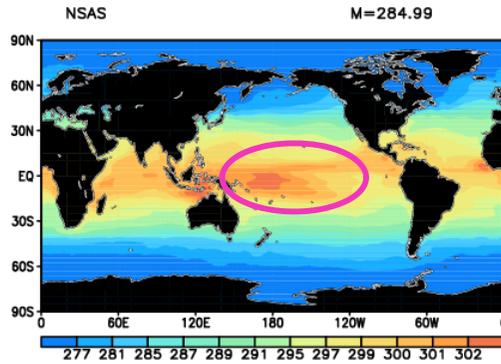
Global 3-months running mean Sea Surface Temperature

Dec 1982(El-nino)

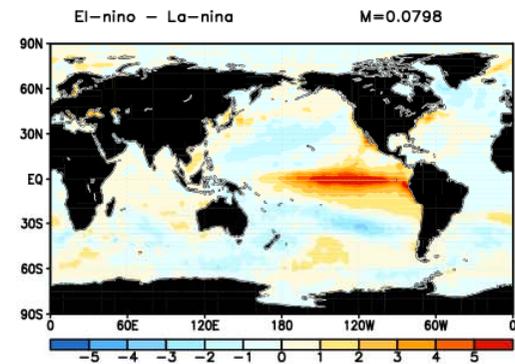
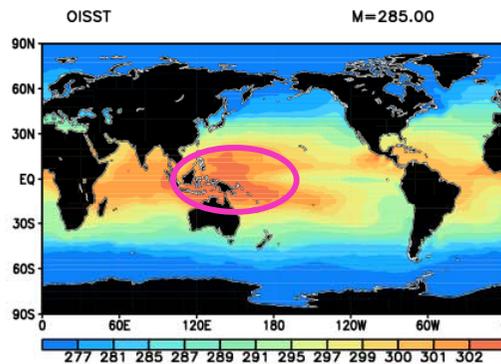
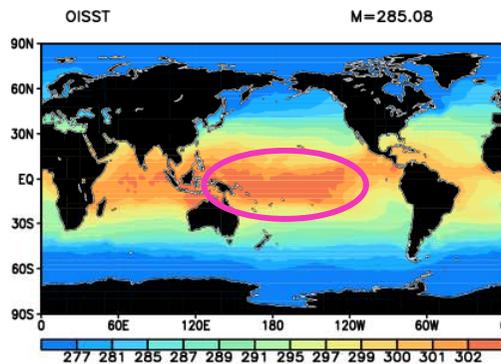
Dec 1988(La-nina)

El-nino - La-nina

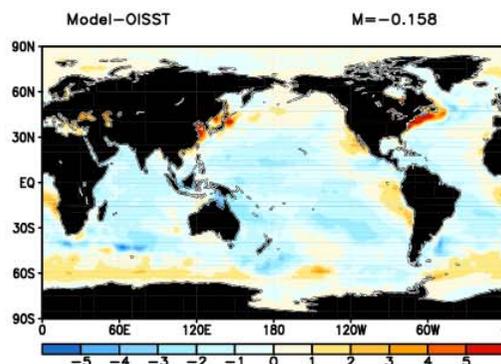
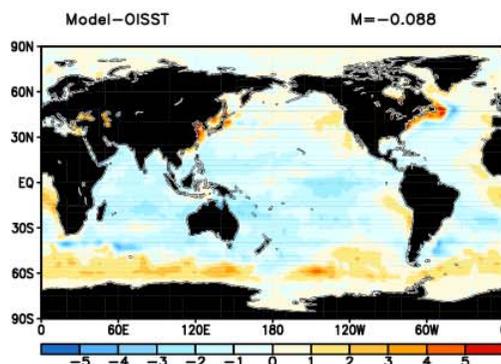
NSAS



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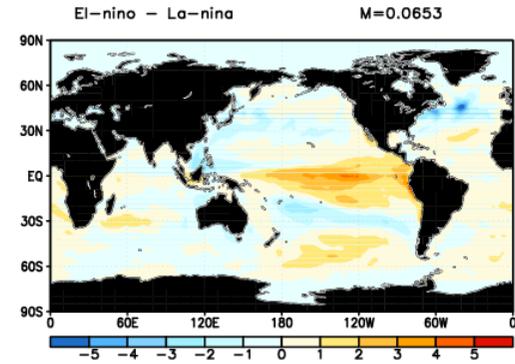
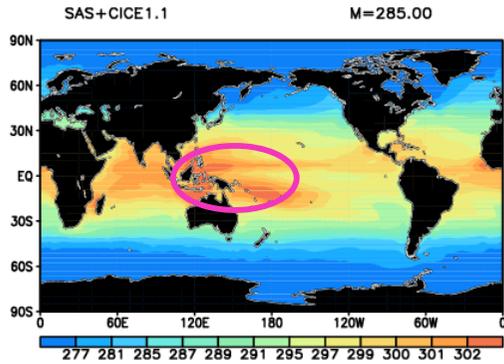
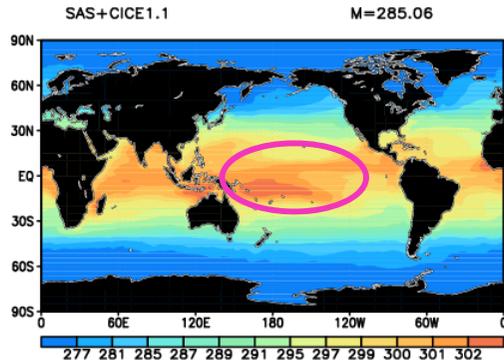
Global 3-months running mean Sea Surface Temperature

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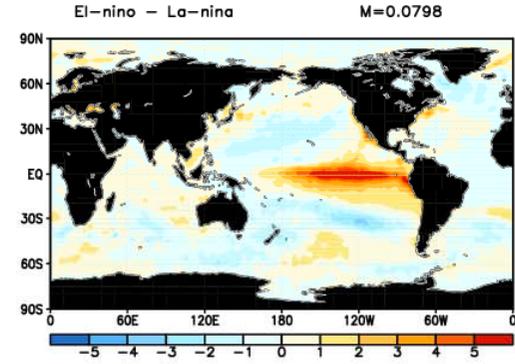
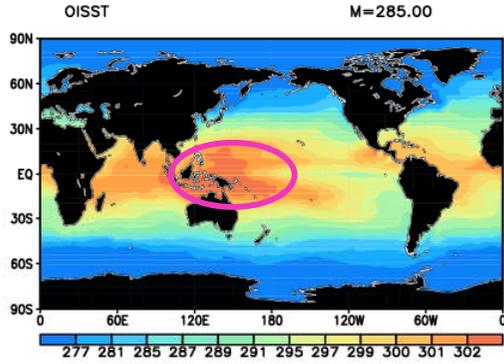
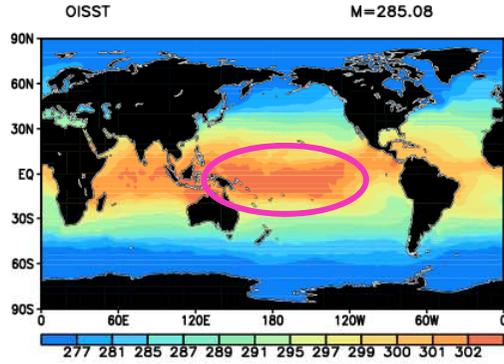
Dec 1988(La-nina)

El-nino - La-nina

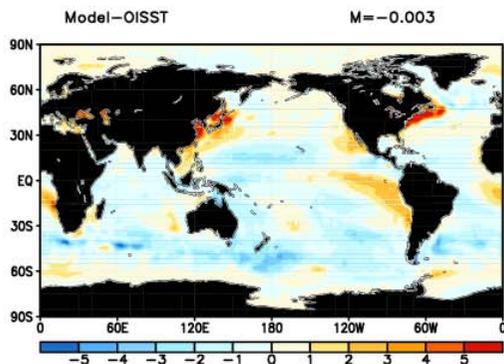
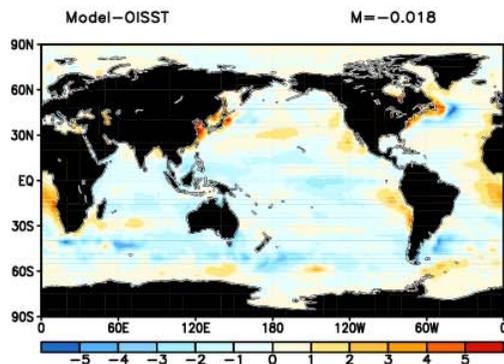
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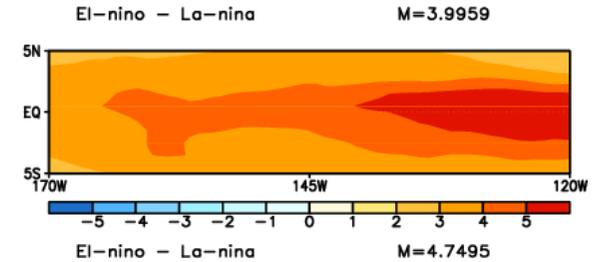
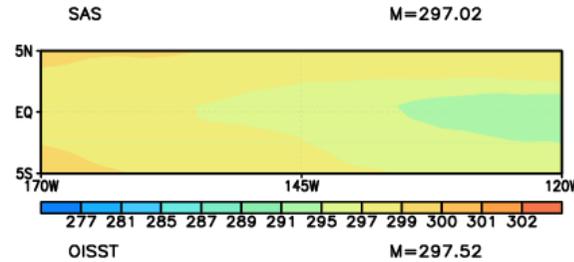
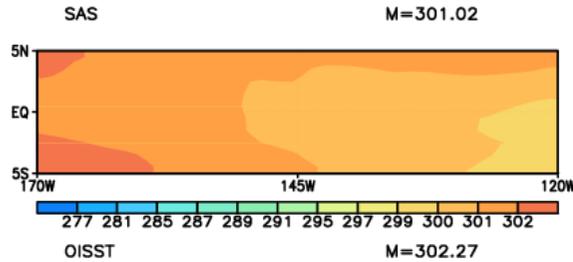
Global 3-months running mean Sea Surface Temperature

Dec 1982(El-nino)

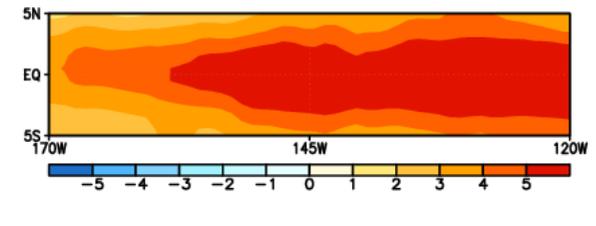
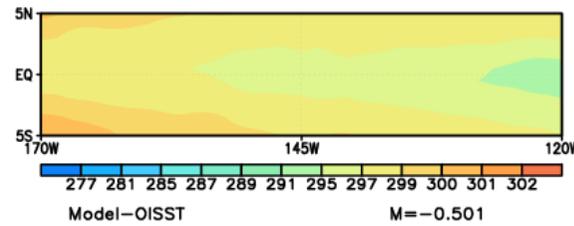
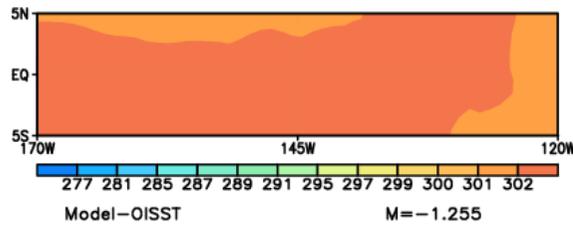
Dec 1988(La-nina)

El-nino - La-nina

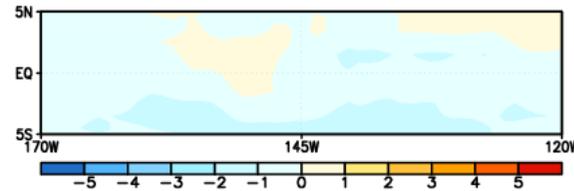
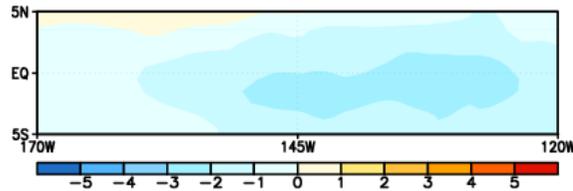
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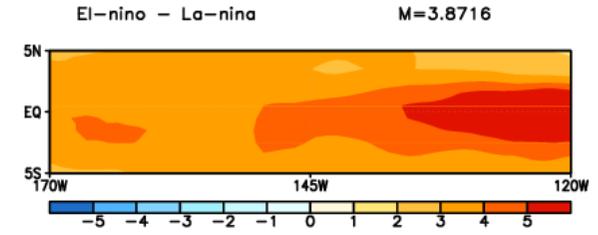
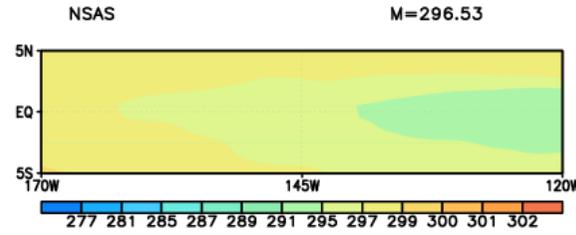
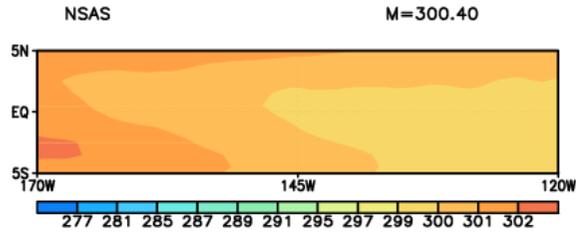
Nino3.4 3-months running mean Sea Surface Temperature

Dec 1982(El-nino)

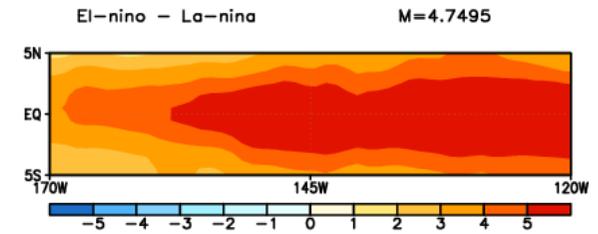
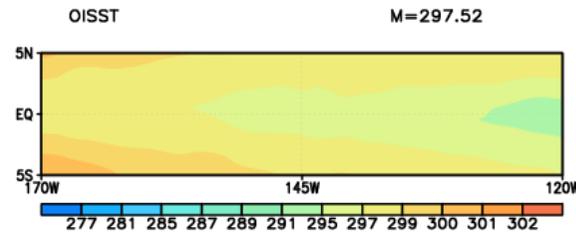
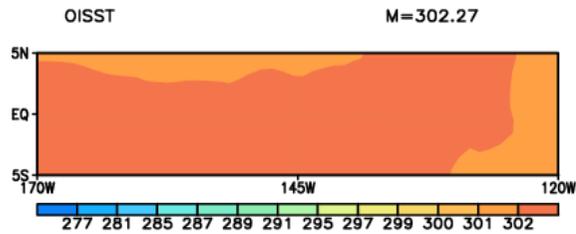
Dec 1988(La-nina)

El-nino - La-nina

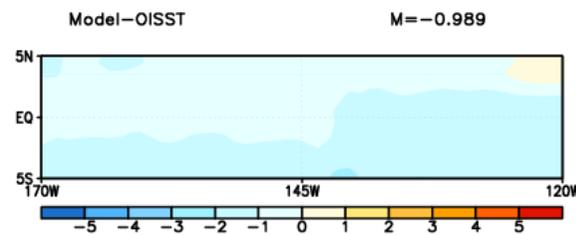
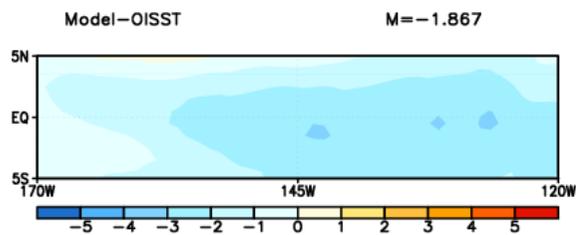
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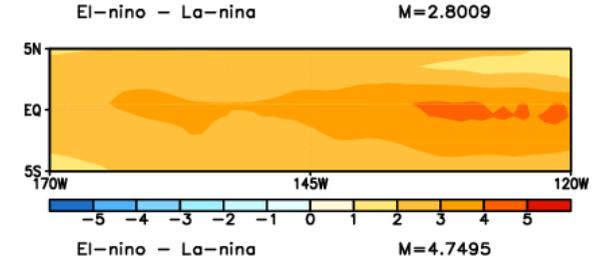
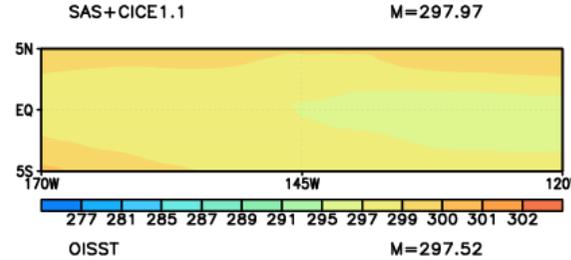
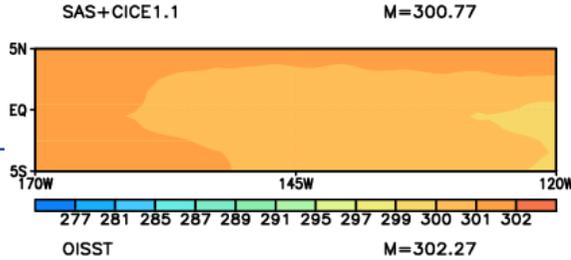
Nino3.4 3-months running mean Sea Surface Temperature

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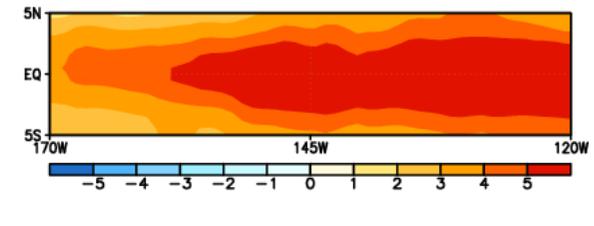
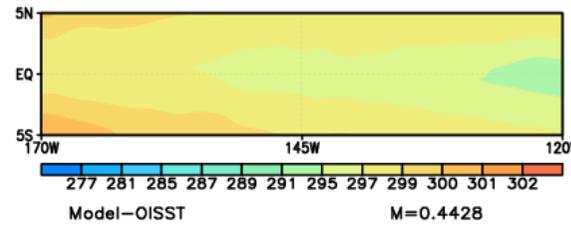
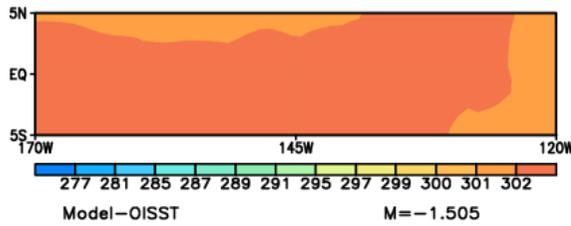
Dec 1988(La-nina)

El-nino - La-nina

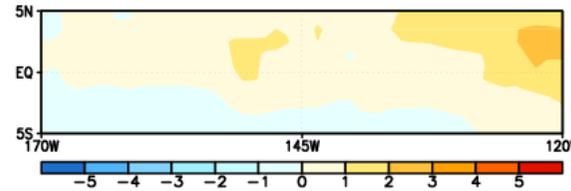
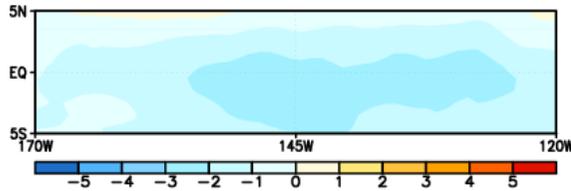
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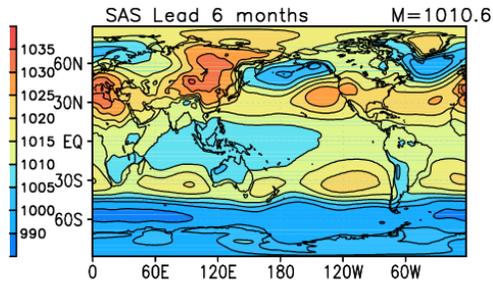
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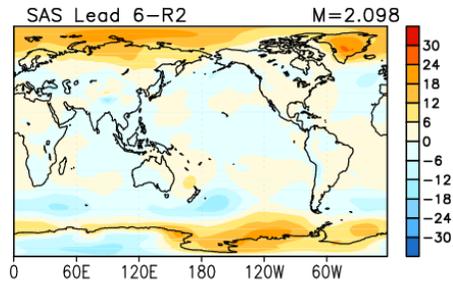
Nino3.4 3-months running mean Sea Surface Temperature

實驗結果-氣象變數場

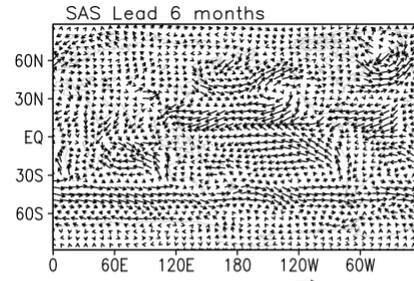
1989 JAN Monthly Mean Sea Level Pressure (hPa)



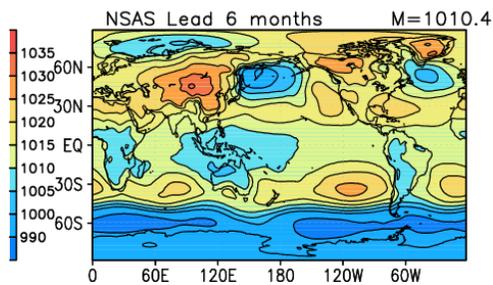
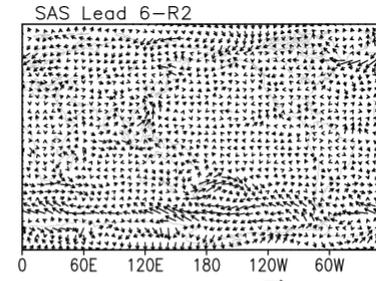
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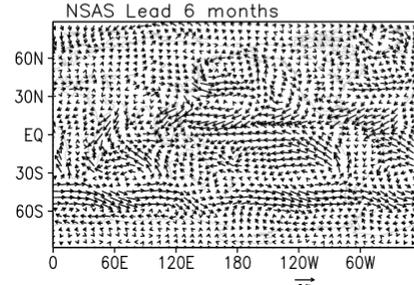
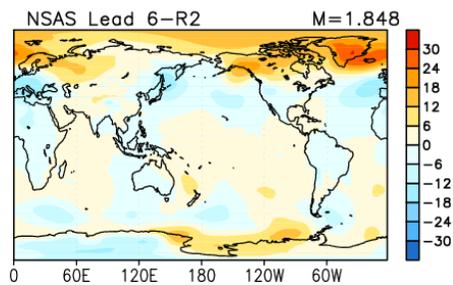
1989 JAN Monthly Mean 10m Wind Speed (m/s)



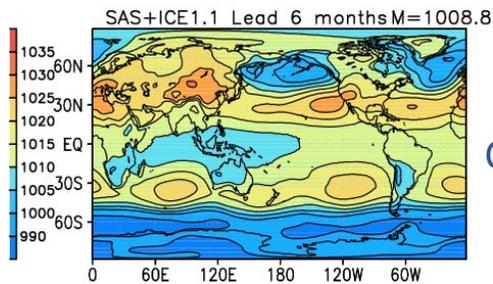
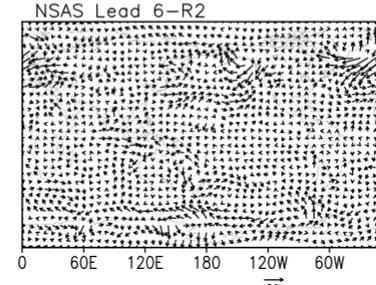
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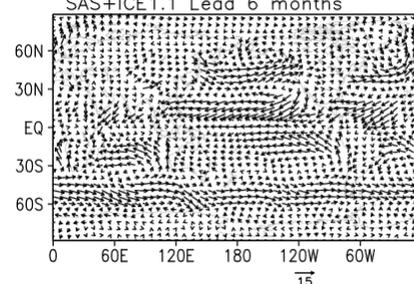
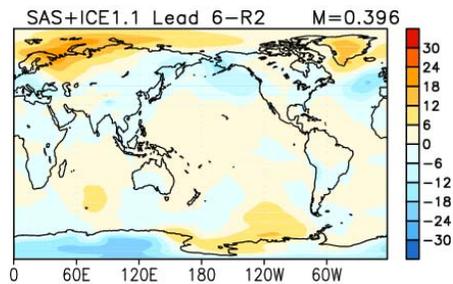
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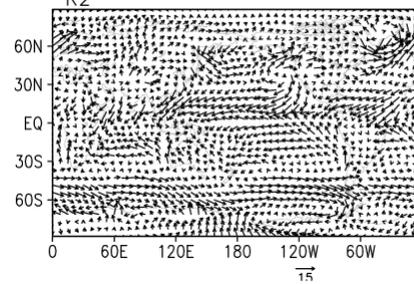
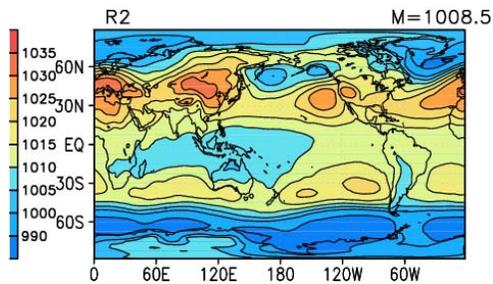
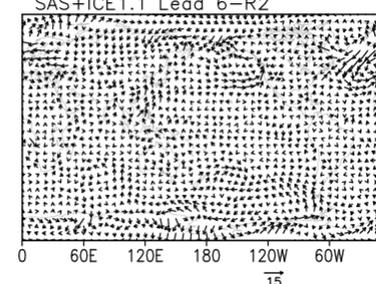
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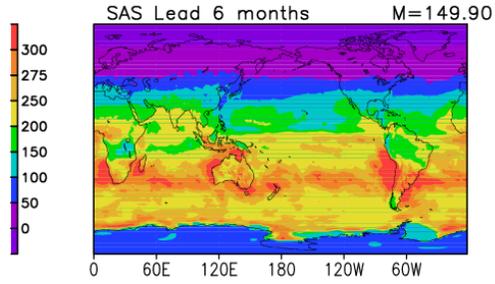


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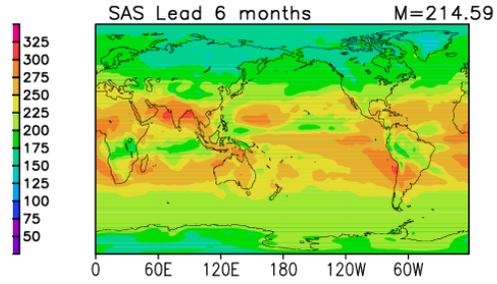
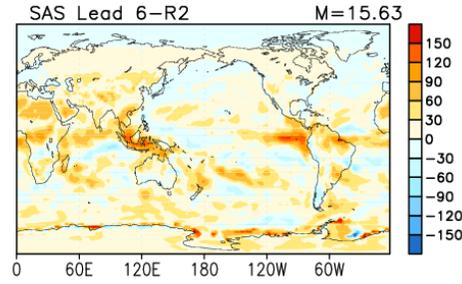


1989 JAN Monthly Mean Net Surface Shortwave Radiation (W/m^2)

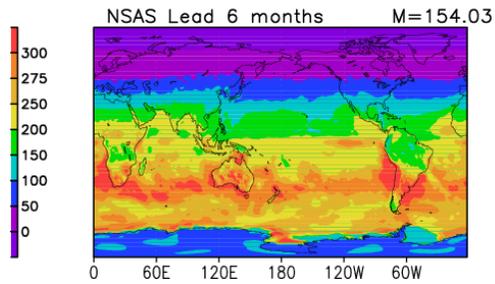
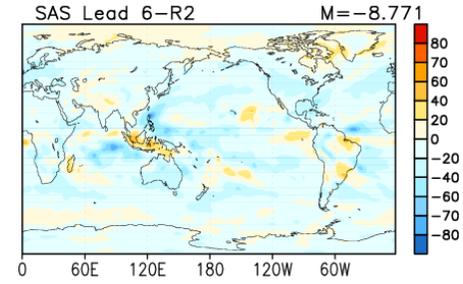
1989 JAN Monthly Mean Outgoing Longwave Radiation (W/m^2)



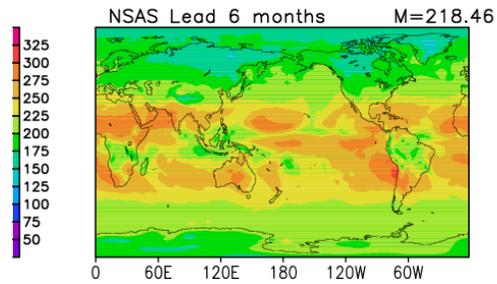
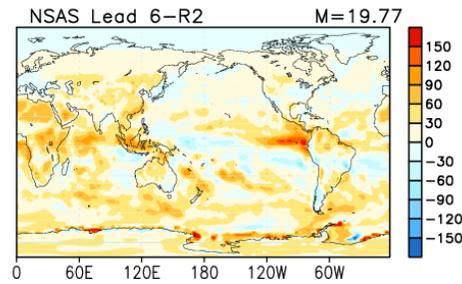
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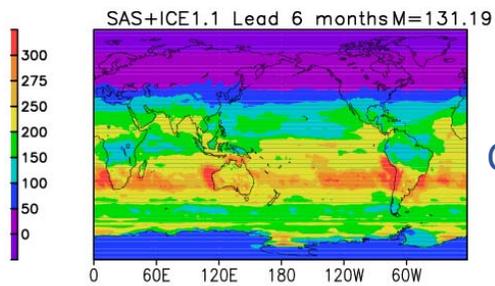
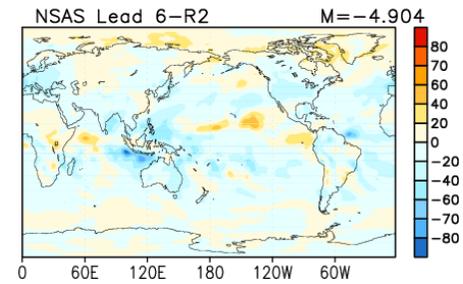
SAS



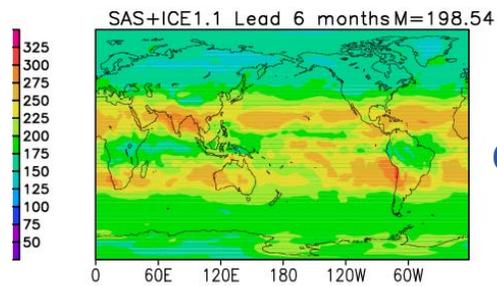
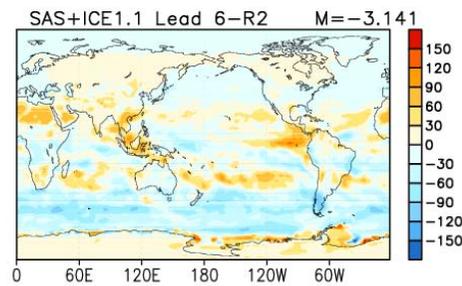
NSAS



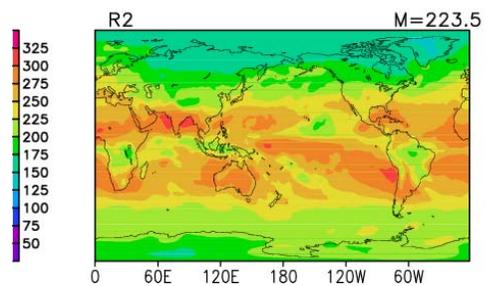
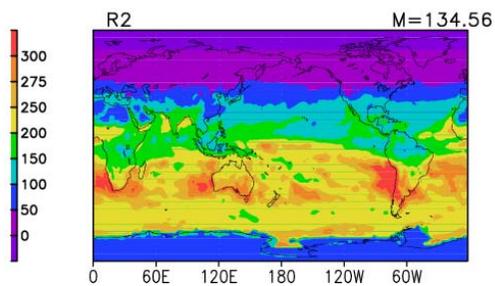
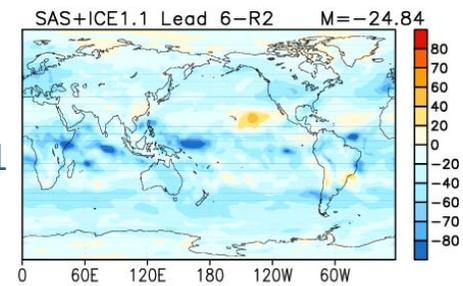
NSAS



SAS+
CICE1.1



SAS+
CICE1.1



結論

- 透過修改模式物理過程(如:SAS、NSAS、SAS+CICE1.1)能有效使海洋增溫，改善模式本身存在的cold bias。修改模式大氣物理過程比起 flux correction與海洋模式耦合，是較完善海氣耦合模式。
- 海溫:SAS表現較佳，且聖嬰趨勢最為顯著；雖然NSAS在時間序列圖有偏低的趨勢，但能表現出聖嬰趨勢；SAS+CICE1.1在時間序列圖稍為偏暖，但聖嬰趨勢較前兩者低。
- 各氣象場比較結果，以SAS+CICE1.1全球平均結果、pattern最接近NCEP R2再分析場。

實驗組別	SLP	10m風場	NSWsfc	OLR
SAS	2	1	2	2
NSAS	3	3	3	1
SAS+CICE1.1	1	2	1	3

- 雖然三組實驗中，以SAS+CICE1.1在各氣象場的表現最好。但考慮模式在聖嬰預報的表現，選擇以SAS進行事後預報。

未來工作項目

- 做30年或者更多年的CMIP type積分之結果分析。
- 進行hindcast，分析模式對ENSO預報能力。

謝謝聆聽

