

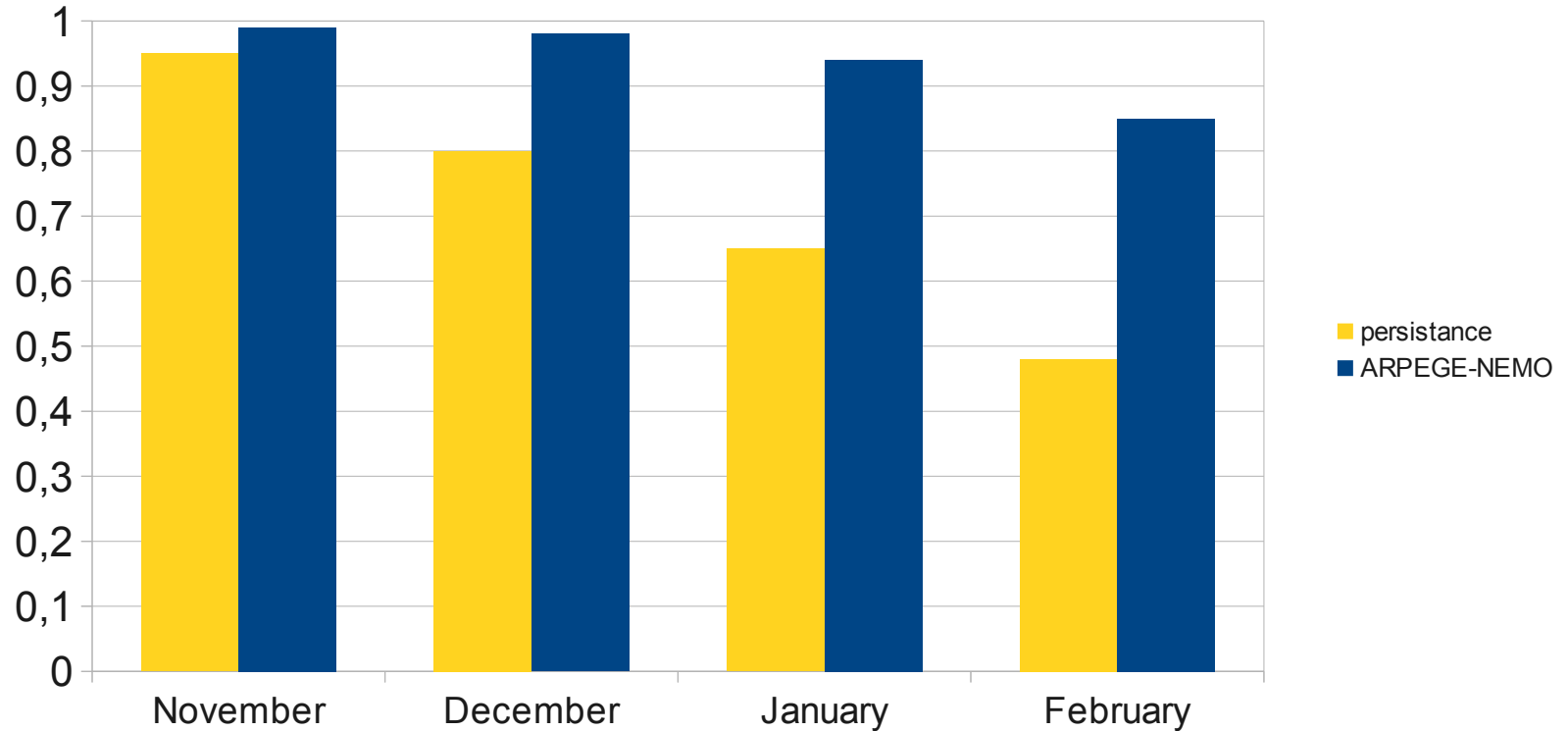
# Improvement in (winter) seasonal predictability by including a stratospheric description in the forecast model

**Michel Déqué, Jean-François Guérémy  
and David Saint-Martin  
Météo-France, Toulouse**

Why do we couple with an ocean ?

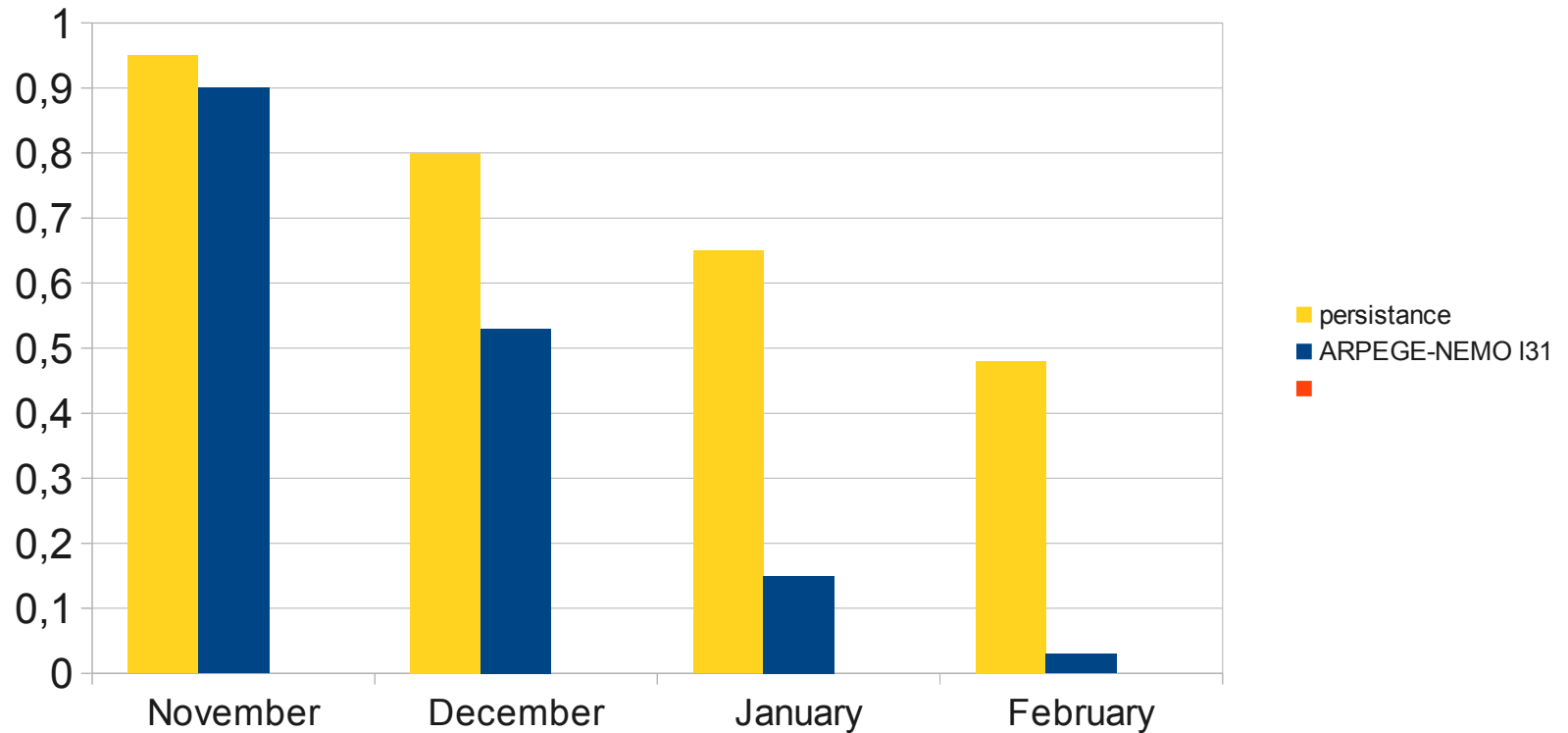
**Seasonal Forecasting**

# Why do we couple with an ocean ?



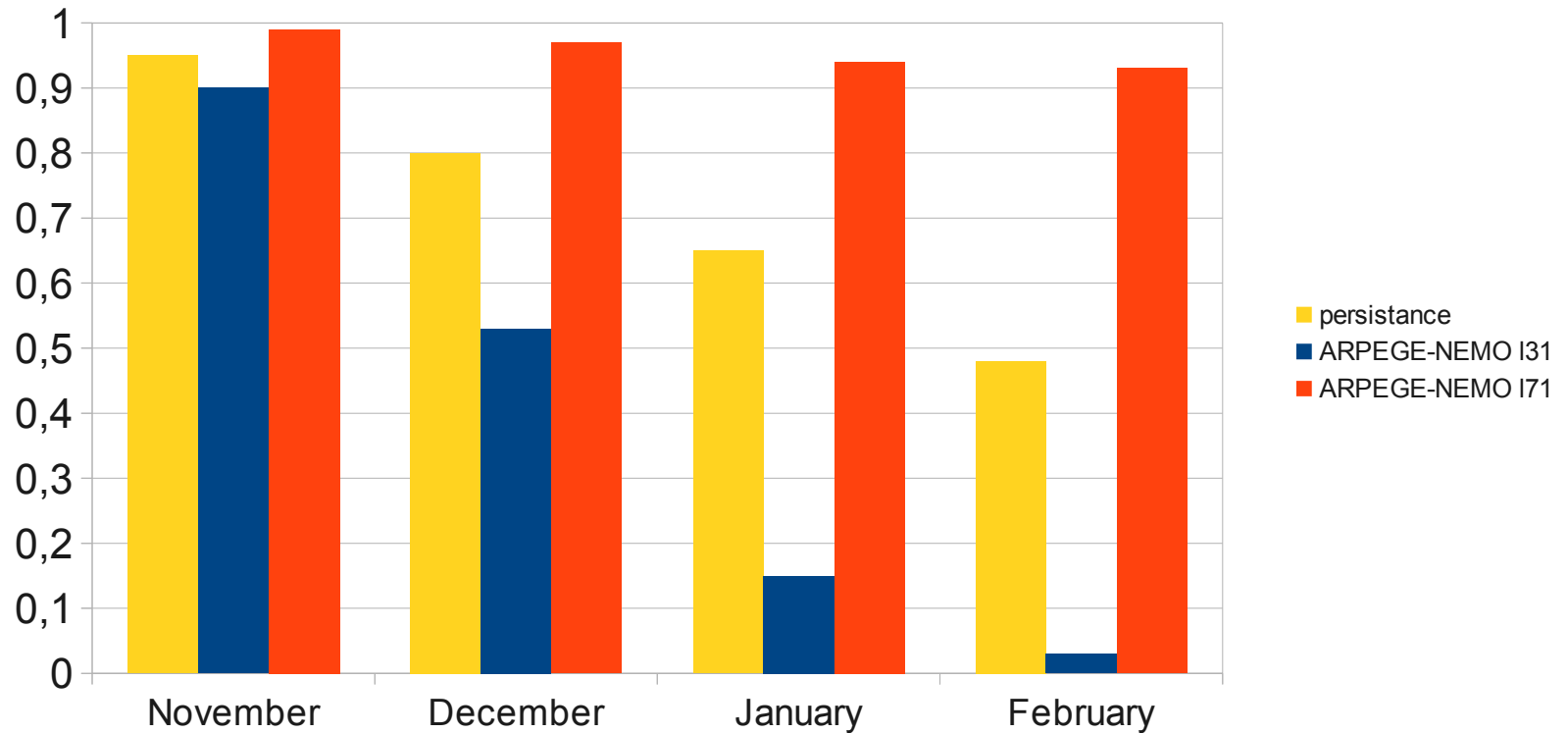
## Nino 3.4 SST correlation 1979-2012

# Why not coupling with a stratosphere ?



**QBO index correlation 1979-2012**

# Why not coupling with a stratosphere ?



**QBO index correlation 1979-2012**

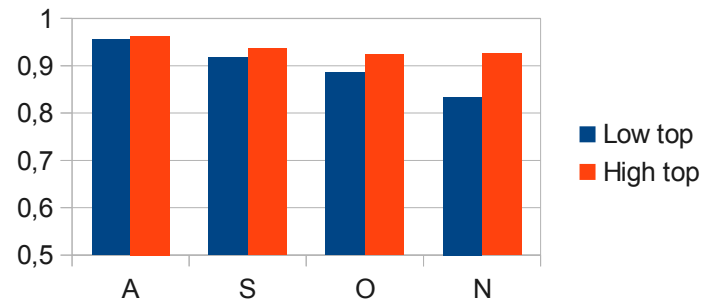
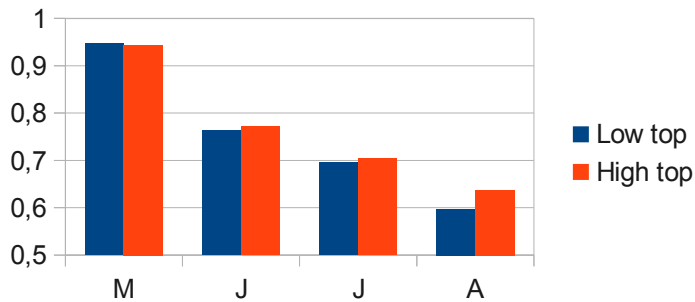
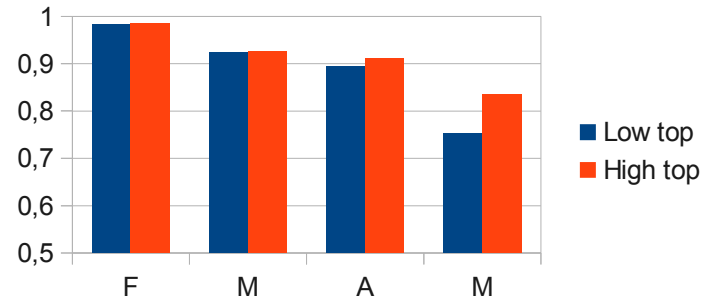
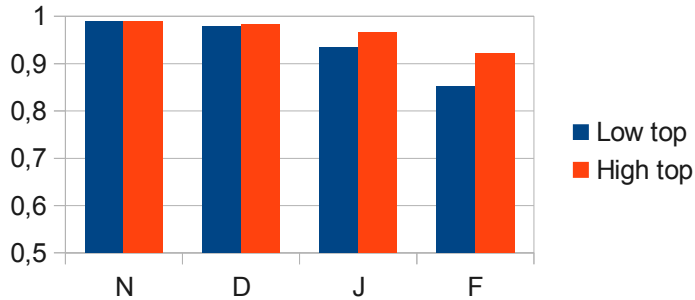
# The experiment

- 34 years (1979-2012)
- 30 members (stochastic dynamics)
- 4-months (month 2-4 average)
- 4 seasons: DJF MAM JJA SON

# The model

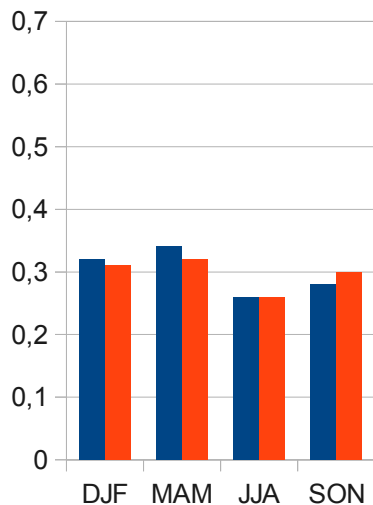
- CNRM-CM5 (or Eurosis 4)
- ARPEGE TL127
- NEMO 1°
- Low Top: 31 vertical levels (5 above 100 hPa)
- High Top:
  - 71 vertical levels (45 above 100 hPa)
  - interactive ozone (including initialization and linear chemistry)
  - F. Lott parameterization of non orog. GWD

# Correlation Nino 3.4 SST

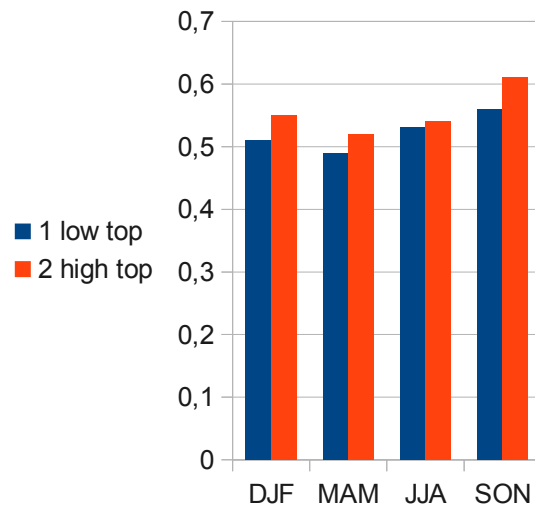




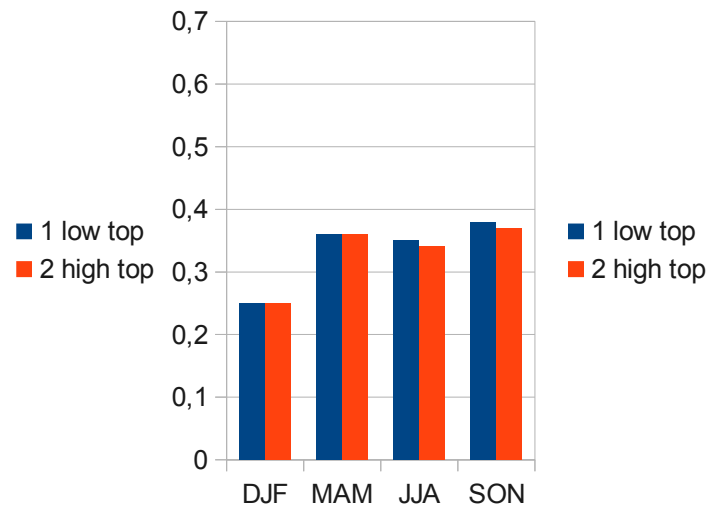
# Correlation surface temperature



**90S-30S**

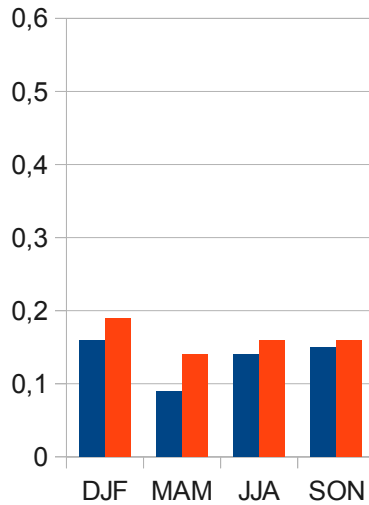


**30S-30N**

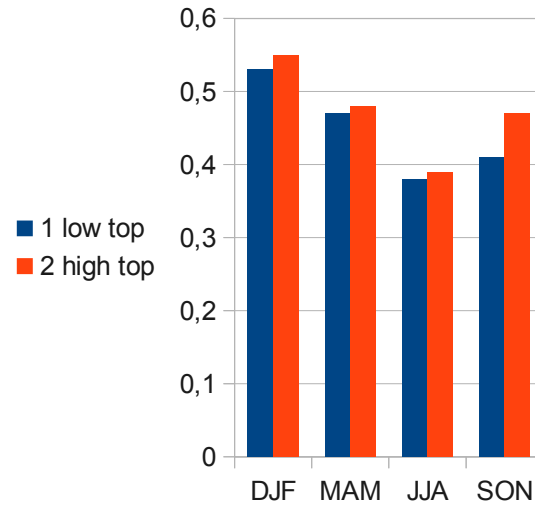


**30N-90N**

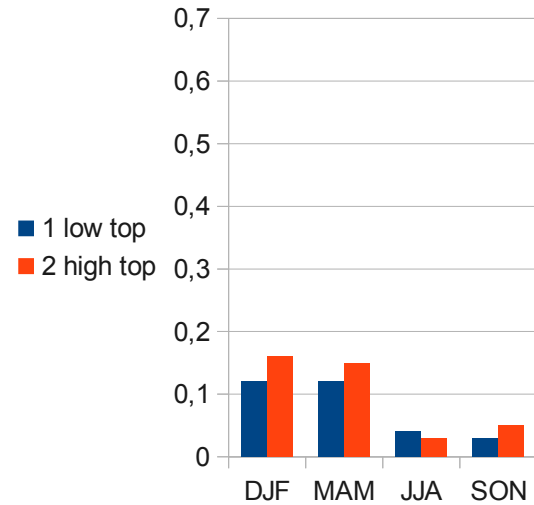
# Correlation precipitation



**90S-30S**

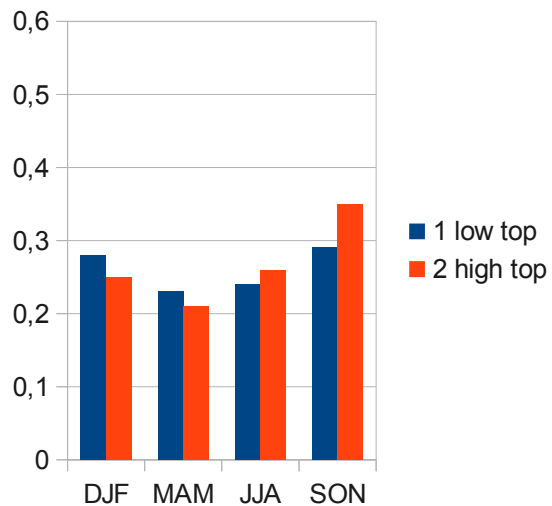


**30S-30N**

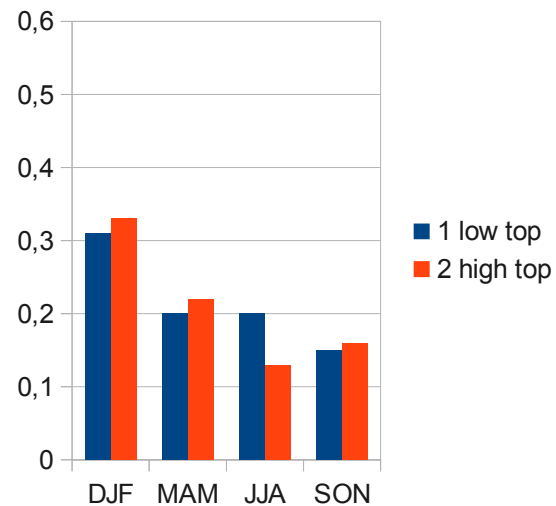


**30N-90N**

# Correlation Z500



**90S-30S**



**30N-90N**

# Indices of midlatitude circulation

	Low top	High top
NAO (DJF)	0.43	0.48
NAM (DJF)	0.19	0.26
SAM (JJA)	0.10	0.30

# NAO statistical significance

- 30 additional simulations of NDJF High top
- 500 scores : 30 members are selected amongst 60
- **Q05%=0.38 Q95%=0.61** : improvement not significant
- 34 years 15 members : **Q05%=0.25 Q95%=0.60**
- 17 years 30 members : **Q05%=0.30 Q95%=0.60**

# Conclusions

- Significant improvement of QBO
- Significant improvement of ENSO
- Non-significant improvements in mid-latitude (individual scores)
- But more increases than decreases
- And confirmation for DJF northern midlatitudes :
  - 3 similar experiments (without stochastic physics, with different physical parameterizations, at lower resolution)