# 気候変動予測と
# アフリカ南部における応用

## Prediction of Climate Variations and its Application in the Southern African Region

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ACCESS
APPLIED CENTER FOR CLIMATE & EARTH SYSTEMS SCIENCE

東京大学
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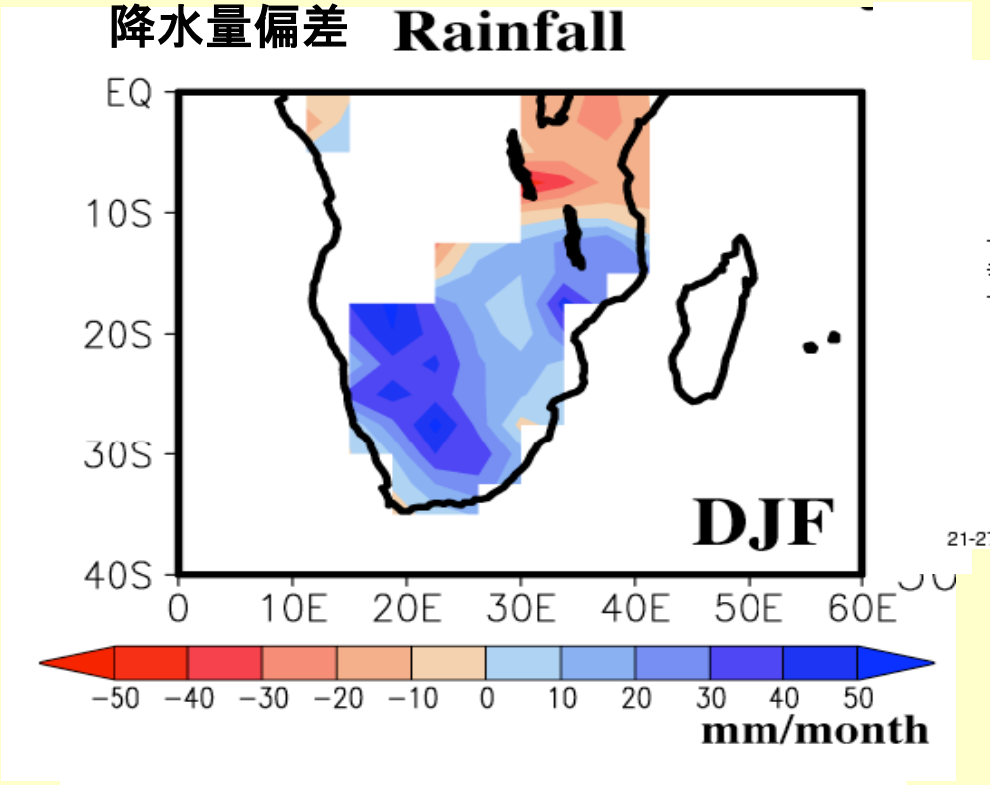
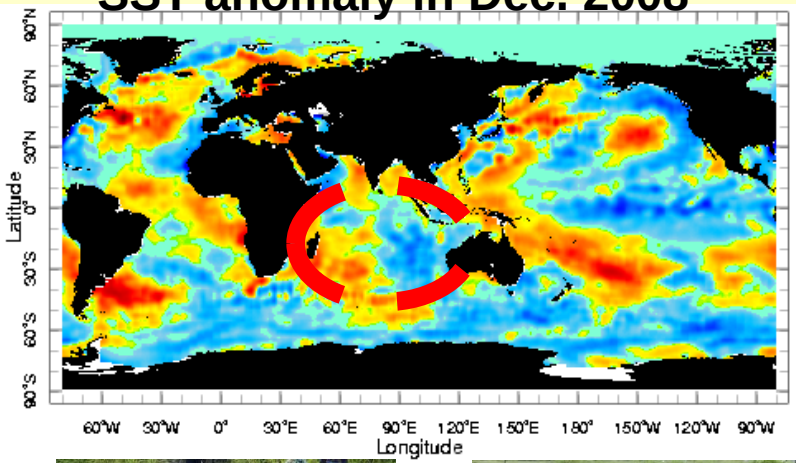
# 南インド洋の亜熱帯ダイポールモード現象は アフリカ南部の降雨と関係

# Close Relation between Indian Ocean Subtropical Dipole and Heavy Precipitation in Southern Africa

降水量偏差 Rainfall




海面水温偏差（2008年12月下旬）
SST anomaly in Dec. 2008

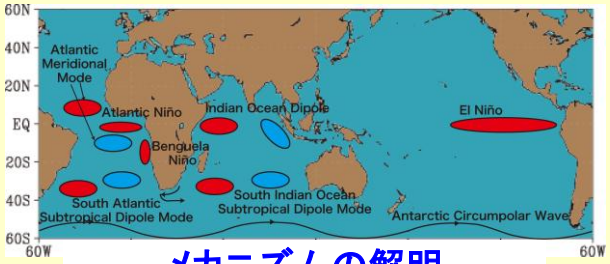




2008/09年の夏に発生した亜熱帯ダイポールモード現象は、その夏の洪水の一因であると考えられている。The Subtropical Dipole Mode occurred in 2008-09 austral summer seems to be closely related to severe floods in the southern African region

# プロジェクトの全体像　Overview of the project

## Clarifying mechanisms

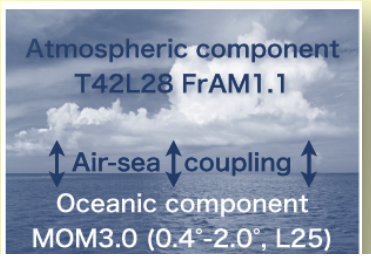



メカニズムの解明
予測可能性の評価

## Global prediction using CGCM

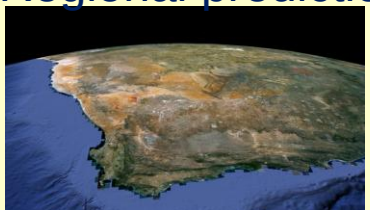
大気海洋結合モデルによる
広域気候変動予測

## Improving CGCM




大気海洋結合モデルの
高精度化

## Regional prediction



領域モデルによるアフリカ
南部の地域気候変動予測

## Building research networks


研究者ネットワークの構築

SATREPS
JST
JICA ジャイカ

地球規模課題対応
国際科学技術協力事業

**アフリカ南部における環境問題に適用可能な季節気候予測システムの能力強化**


早期予測
システム
の改良

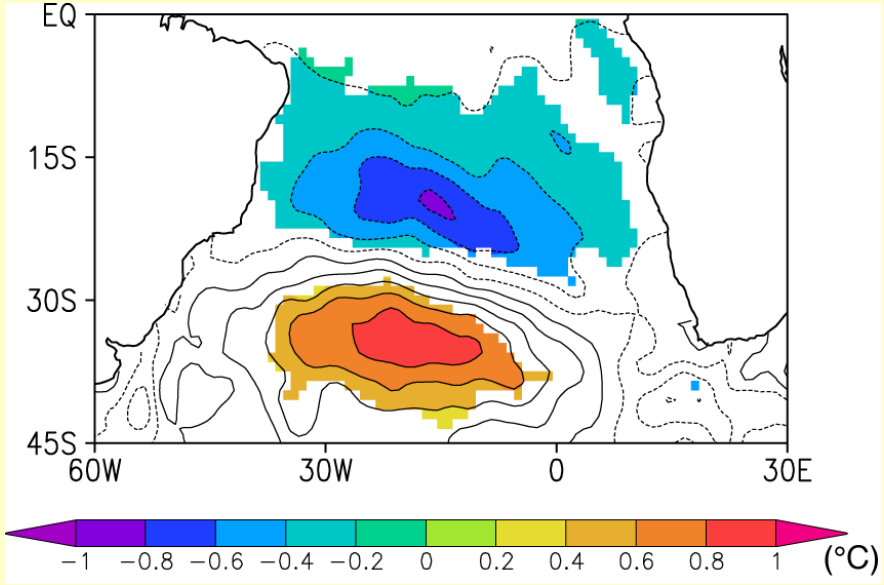

Contributing to enhancement of seasonal prediction capacity in southern Africa

# アフリカ南部に異常気象をもたらす南大西洋(および南インド洋)亜熱帯ダイポールモード現象のメカニズムを解明

# Generation Mechanism of the Subtropical Dipole

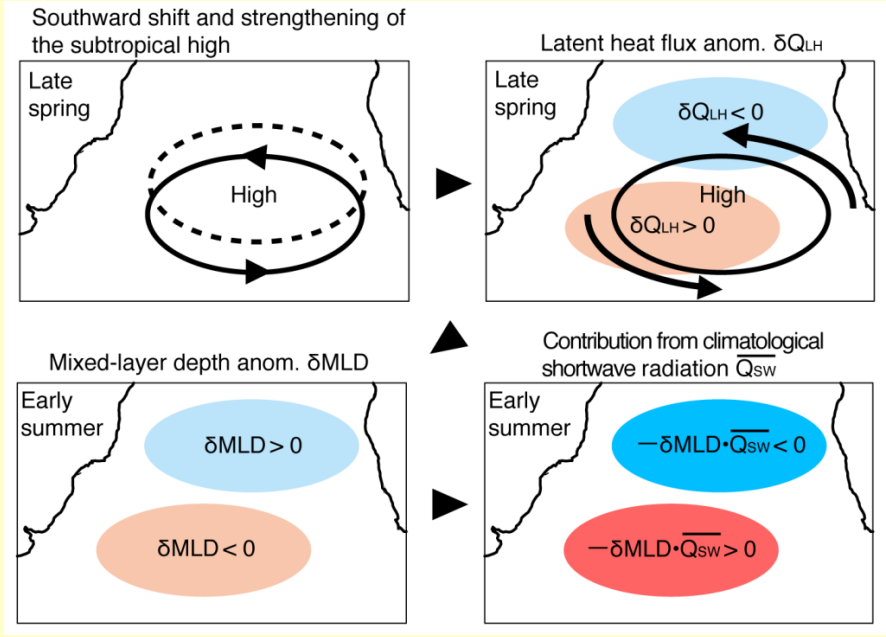
## 南大西洋亜熱帯ダイポールモード現象に伴う海面水温偏差

## SST anomaly of the Subtropical Dipole



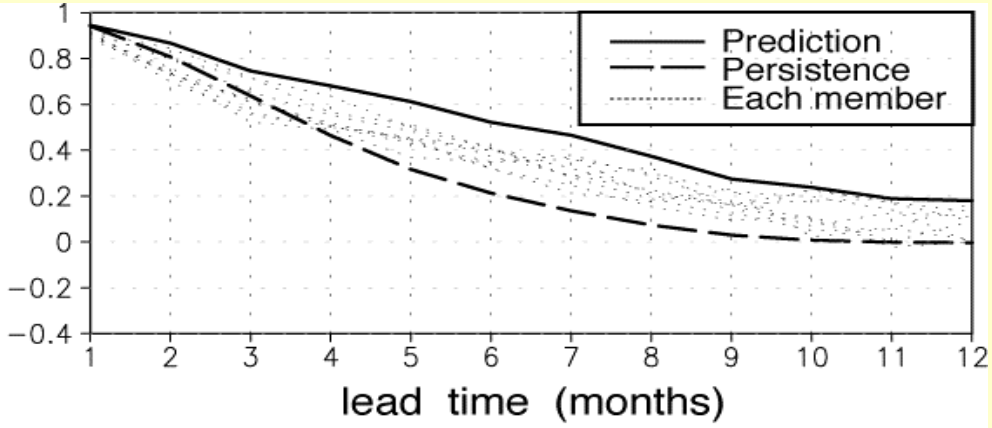

## 南大西洋亜熱帯ダイポールモード現象のメカニズム(模式図)

## Schematic picture of generation mechanism

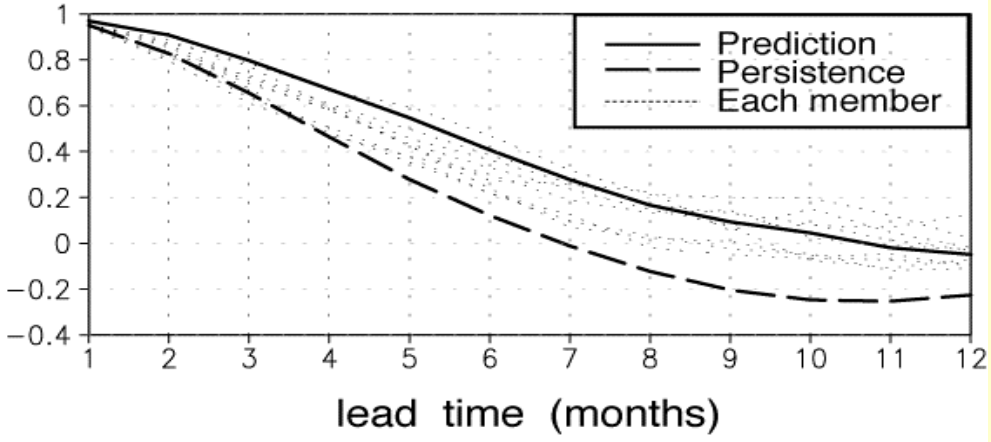


# 亜熱帯ダイポールモード現象-の予測可能性を世界で初めて示す
# First demonstration of predictability of the Subtropical Dipole

南インド洋亜熱帯
ダイポールモード現象
の予測精度



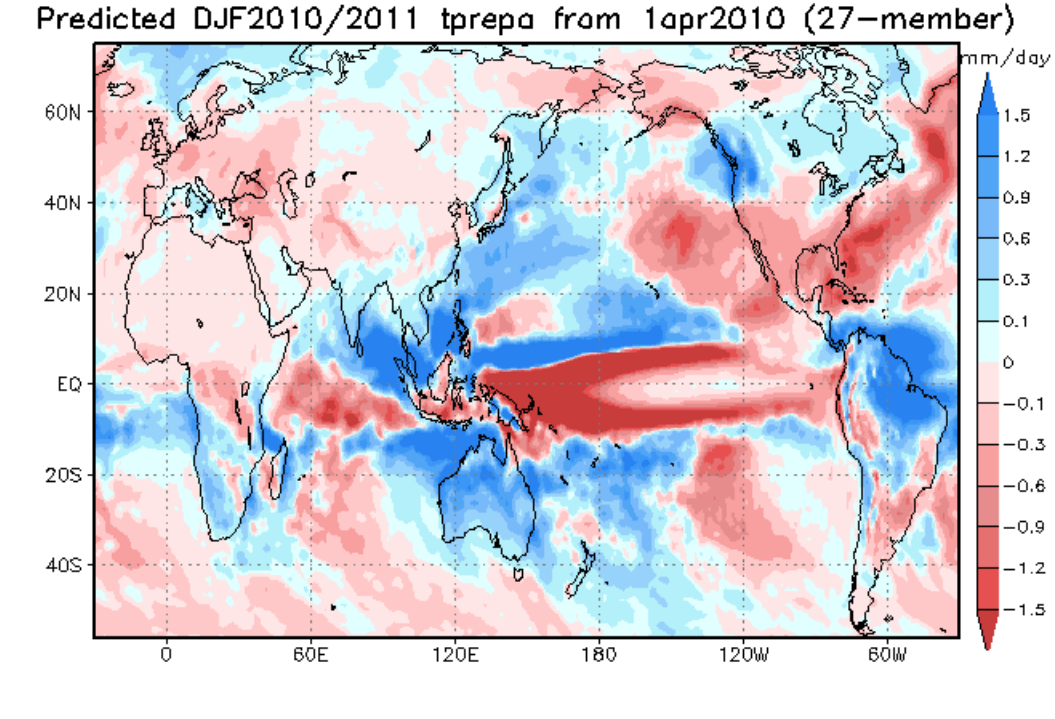

南大西洋亜熱帯
ダイポールモード現象
の予測精度



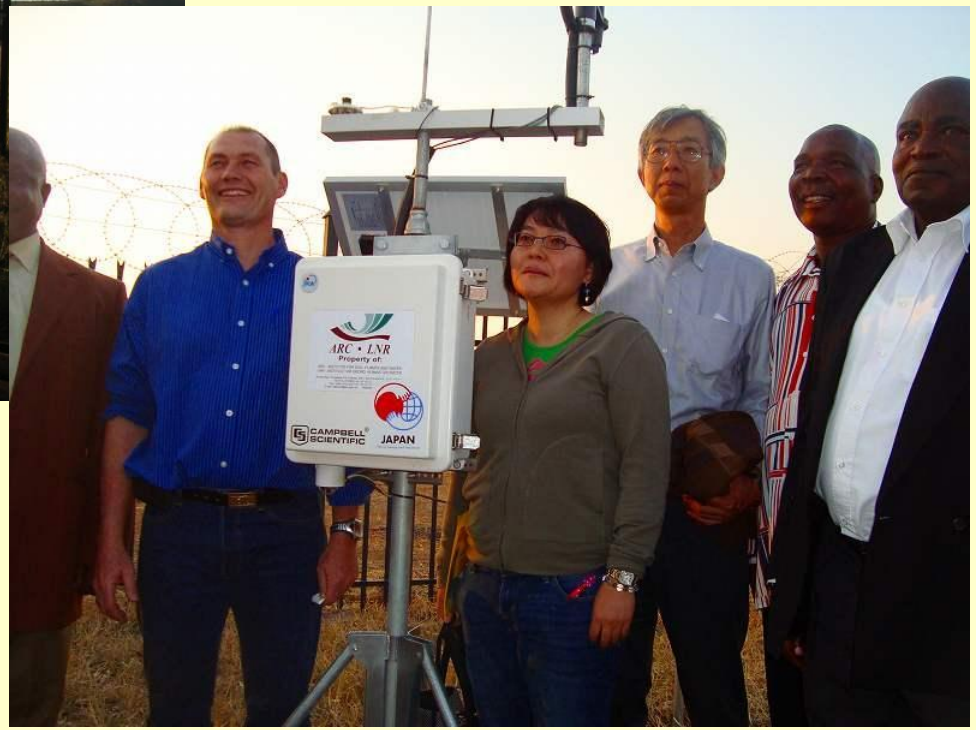
# 2010年12月～2011年1月の南アフリカにおける大雨を半年以上も前から予測

# Successful prediction of anomalous rainfall during summer in 2010/2011

2010年4月に2010年12月～2011年2月の降水量を予測した結果




# 自動気象観測装置の設置
# Implementing Automated Weather stations for Validation




季節予報モデルや
ダウンスケーリングモデルの
詳細な検証が可能に！

# COP17@ダーバンでのサイドイベント
# Side event at COP17 in Durban

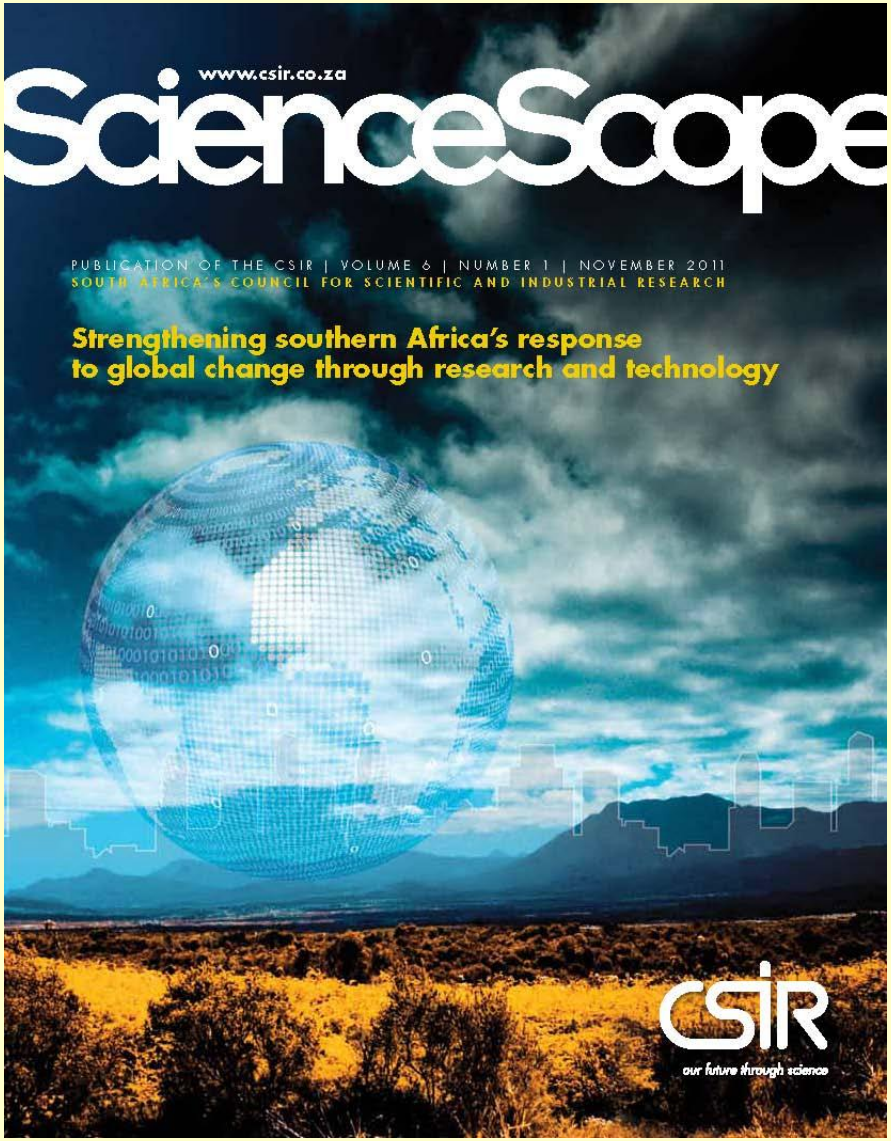
**ACCESS-SATREPS side event at COP 17**
**Venue: CCR Expo Umngeni Conference Room**
**Date: 2Dec. 2011 15:00-18:00**

**"African Climate Variability as a Test for Climate Change Models"**

| | | |
|---|---|---|
| Welcome and introduction | Dr. Jimmy Adegoke (CSIR / ACCESS) | 15:00-15:05 |
| Opening remarks | Mr. Imraan Patel (DST) | 15:05-15:10 |
| Scientific Presentations<br><br>Facilitator: Dr. Neville Sweijd | Dr. Willem Landman (CSIR) | 15:10-15:30 |
| | Dr. Swadhin Behera (JAMSTEC) | 15:30-15:50 |
| | Dr. Francois Engelbrecht (CSIR) | 15:50-16:10 |
| | Dr. Hirofumi Sakuma (JAMSTEC) | 16:10-16:30 |
| | Dr. Chris Lennard (UCT) | 16:30-16:50 |
| Tea and wine break | SATREPS Video showing | 16:50-17:10 |
| Panel discussion "African Climate Variability as a test for Climate Change Models" | Facilitator: Dr. Neville Sweijd<br>Panelists<br>Prof. Bruce Hewitson (UCT)<br>Dr. Hirofumi Sakuma (JAMSTEC)<br>Dr. Willem Landman (CSIR)<br>Mr. Cobus Olivier (SAWS)<br>Dr. Swadhin Behera (JAMSTEC)<br>Dr. Hamisai Hamandawana (ARC) | 17:10-17:55 |
| Closing Remarks | Dr Jimmy Adegoke | 17:55-18:00 |

NHK BS1、
NHK World
でも報道

# 相手国の主要な研究機関紙への寄稿
# Contribution to Science Scope in South Africa




A CHANGING PLANET – The atmosphere

## Getting the next season right:
## El Niño or La Niña?

It was probably during the summer of 1982/83 when the country experienced one of the worst droughts in decades that South Africans first learnt of the phenomenon called El Niño. In climate science terms, this El Niño event has been described as a "significant" and "unprecedented" warm episode.

IN SHORT, an El Niño event is most often associated with less rain and higher temperatures, while a La Niña event often brings cooler temperatures and more rain for southern Africa.

Today, CSIR atmospheric modellers are working with one of the foremost experts on the El Niño event. Through the Applied Centre for Climate and Earth Systems Science (ACCESS), a flagship initiative of the Department of Science and Technology and hosted by the CSIR, Prof Toshio Yamagata of the University of Tokyo is contributing to enhance our ability to forecast the possibility of an El Niño or La Niña event to occur for the next season and how these phenomena may impact on southern African summer conditions.

The project, "Prediction of Climate Variations and its Application in the Southern African Region', is supported by the Japan Science and Technology Agency (JST) and the Japan International Cooperation Agency (JICA).

"The Intergovernmental Panel on Climate Change (IPCC) report discusses the global climate tens of years or a hundred years hence, using models of climate change based on greenhouse gas emission scenarios," says Prof Yamagata.

"However, it would be dangerous to discuss the impact on local communities using the results of the models used for the IPCC report. This is due to serious problems with the reproducibility of climate variation in those models.

Of course, the outlook is not all pessimistic. This is because initiatives aimed at predicting climate variation, rather than projecting climate change, have been progressing rapidly of late in the professional climate science community.

"We are now at the level where the occurrence of El Niño can be predicted one or two years in advance. This is all due to rapid growth in wide-area planetary observation using satellites and buoys, the enhancement of scientific knowledge and advances in techniques for assimilating observed data into models and making seasonal predictions," he says.

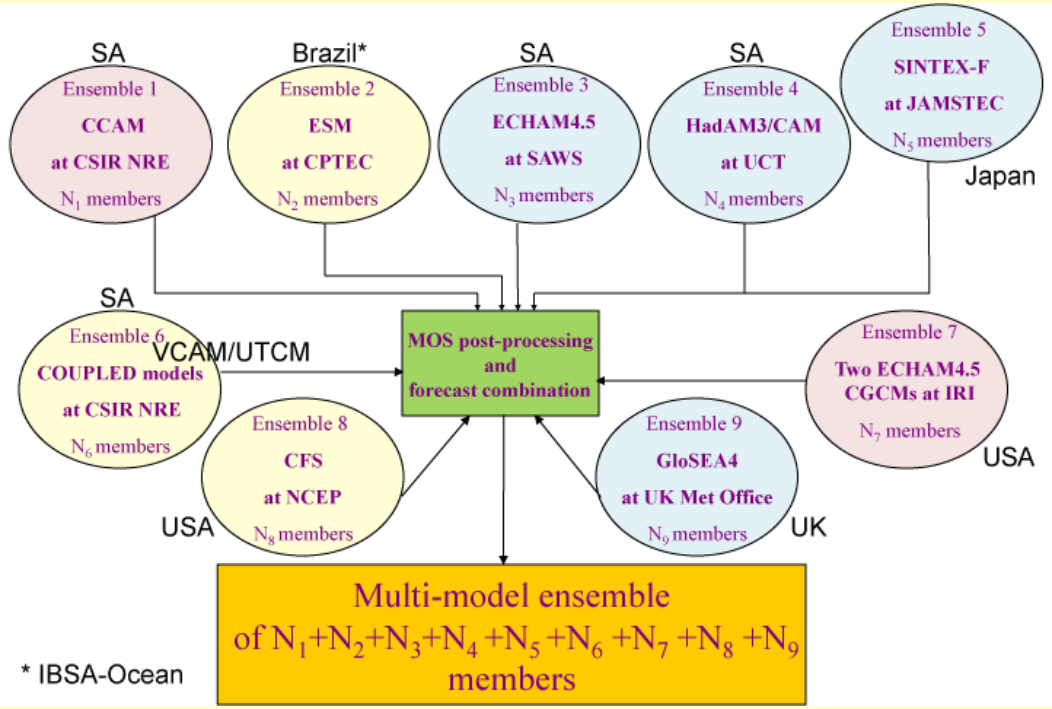
Why would seasonal predictions, compared to the traditional daily to weekly weather forecasts, be significant? Prof Yamagata explains: "Predicting the likelihood of droughts, floods, abnormally high or low temperatures and other extreme weather conditions, between several months and one year in advance will make a direct contribution to socio-economic activities. Measures aimed at protecting the global environment should be promoted in parallel with this prediction of specific climate variation and application measures based on it. Systems in developing countries are particularly vulnerable to floods, droughts and other calamities. If we can cooperate, based on predicted data, in preventing or mitigating disasters as well as promoting infrastructure development and capacity building, we should be able to encourage an understanding of measures to cherish the environment in those countries as well."

### Multi-model ensembles

The South African modelling community has been issuing seasonal forecasts operationally since the early 1990s, but forecast systems have become much more sophisticated since then and are now able to predict seasonal climate anomalies (deviations from average conditions) over southern Africa with a useful level of skill. But just how good are we at forecasting these seasonal anomalies? Driving this research question, and the use of fully coupled ocean-atmospheric

# マルチモデルアンサンブル気候予測を用いた豊かな応用分野
# Rich Application of Seasonal Prediction of Multi-model Ensemble

南アフリカの季節予報システム




- 農業、感染症（マラリア、リフトバレー熱等）対策、ダム管理への応用
- 気候情報を利用する企業（天候デリバティブ、貿易、農業、観光）との連携

# 相手国におけるキャパシティデベロップメント
# 『レクチャー・シリーズによる人材育成への貢献』
# Climate lecture series at several universities in South Africa

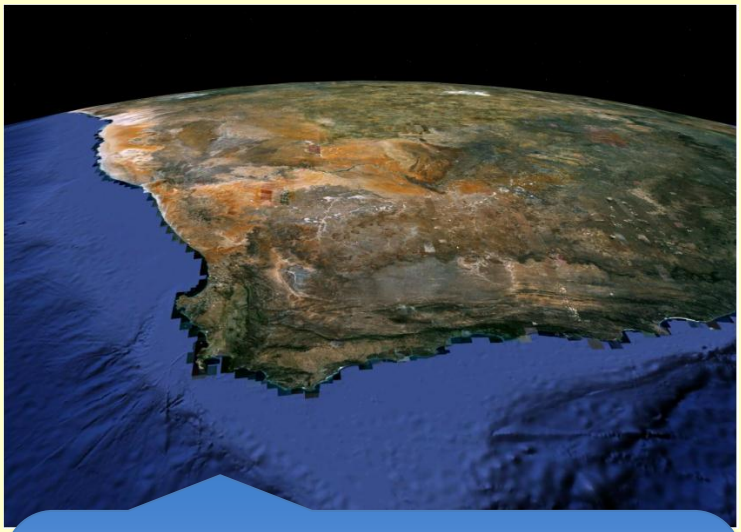


**実施機関**：University of Pretoria、University of Cape Town、University of Western Cape、Cape Peninsula University of Technology、Rhodes University、University of Fort Hare、Walter Sisulu University、South African Weather Service （計８機関）

# 相手におけるキャパシティデベロップメント
# 『ダウンスケーリングモデルの導入』
# Implementation of a regional model for downscaling

ダウンスケーリング用の領域大気モデルをプレトリア大学のワークステーションにインストール。

領域大気モデル



１年先までの気候予測を30km間隔で行えるようになる。

# 相手におけるキャパシティデベロップメント
# 『季節予報用の大気海洋結合モデルの導入』
# Implementation of a coupled ocean-atmosphere model for seasonal prediction


季節予報用の大気海洋結合モデルをCSIRのワークステーションにインストール。

SATREPSのおかげで、大気海洋結合モデルによる季節予報をアフリカ大陸で初めて行えるようになる。

JST＆世界銀行情報センター（PIC東京）共催
写真 パネル展＆コーヒーアワー（10/6/2011）
「人工地球で南アフリカの農業が変わる」

# キャパシティデベロップメント
# 『南アフリカ側学生の日本での研修』
# Research training in Japan

# キャパシティデベロップメント
# 『Dr. Babatunde Abiodun（南アフリカ側若手研究者）の受賞』
# Success story in capacity building


**The Recipients of Prizes for the Best Posters and Papers Presented at the WCRP Open Science Conference**

We are pleased to announce the complete list of awardees for the best posters and papers presented at the World Climate Research Programme (WCRP) Open Science Conference on 24-28 October in Denver, Colorado, USA. All those listed in the table below, received a certificate citing "outstanding poster presentation" or "outstanding presentation" depending whether it was a poster or an oral presentation.

These recipients were selected based on rigorous evaluation of 487 posters and 26 papers presented by students and early career scientists. These were among 1750 posters and 182

# 日本側学生の国際性涵養
# Internationality development of young Japanese student


南アフリカ大気科学学会で
本課題の研究成果を発表

プレトリア大学で南アフリカ側
研究者とディスカッション

東京大学の大学院生（森岡優志）は、本課題の研究を通して、
４本もの論文を在学中に執筆

学位を取得し、ポスドク研究員として国内外で活躍、現在JAMSTEC研究員

# Rich interaction among scientists and policy makers in many places



SAWS / ACCESS Seasonal Climate Prediction Dissemination Workshop 5/6th of April 2011

Standing L-R: Cobus Olivier (SAWS), Nico Kroese (SAWS), Dominic Mazvimadi (UWC), Emma archer (CSIR), Hamisai Hamandawana (ARC), Jonathan Diedricks (NRF), Gerhard Schulze (SAWS), Bruce Hewitson (UCT), Neville Sweijd (ACCESS), Kate Sutherland (UCT), Richard Tswai (ARC), (SAWS), Richard Bugan (CSIR), Sydney Mavungahama (US), Claire Davis (CSIR), Niel Hart (UCT), Felicity Zondo (DWA), Hector Chikore (U Zul), Thando Ndarana (SAWS), Leshion Tholo (CSIR), Mami Katsuya JICA), Johan Malherbe (ARC), Mamora Iida (JST/DST), Asmerom Beraki (SAWS) Kaoru Takahashi (JICA/ACCESS).

Sitting L-R: Masami Nonaka (JAMSTEC) and Toru Miyama (JAMSTEC), Peter Johnston (UCT), Gaborekwe Khambule (SAWS), Modjadji Makoela (SAWS), Cecil Masoka (DFAC), Toshiyuki Nakamura (JICA RES REP), Linda Makuleni (SAWS CEO), Eudy Mabuza (DST), Tshawekazi Tembani (DST), Jimmy Adegoke (CSIR NRE Director /ACCESS)

Inset: Willem Landman (CSIR), Hannes Rautenbach (UP), Deon Terblanche (SAWS)

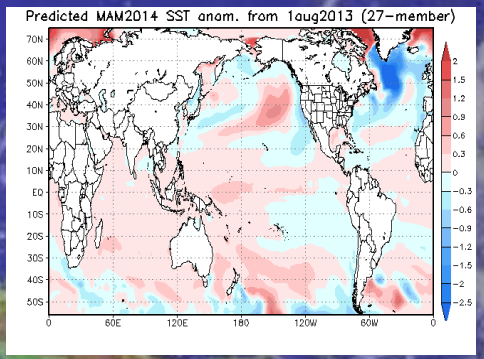
L-R: Dr Jimmy Adegoke (NRE CSIR/ ACCESS), Ms Kauro Takahashi (ACCESS/JICA), Ms Felicity Zondo (DWA), Prof Bruce Hewitson (UCT), Mr Cecil Masoka (DFAC), Dr Hoffie Marie (CSIR Exec), Mr Toshiyuki Nakamura (JICA Res Rep), Dr Hamisai Hamandawana (ARC), Dr Linda Makuleni (SAWS CEO), Prof Dominic Mazvimavi (UWC) and Mr Hector Chikore (U Zul)

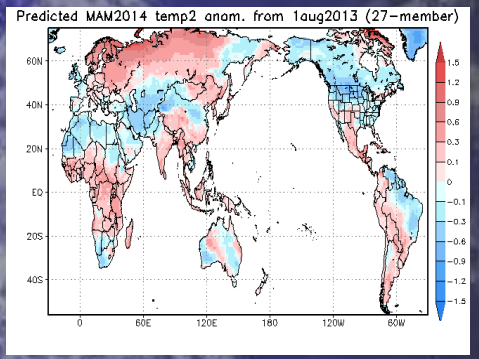
# For realization of sustainable well-being and human security on our unique habitable planet by developing seasonal prediction and its application

# かけがえのない地球に良き生と人間安全保障の実現を目指して

Climate prediction system (Earth observation, understanding and modeling)

Prediction and validation




Information delivery and application to societal activities

Agriculture

Safety

Human health

Water resources


Production

Insurance