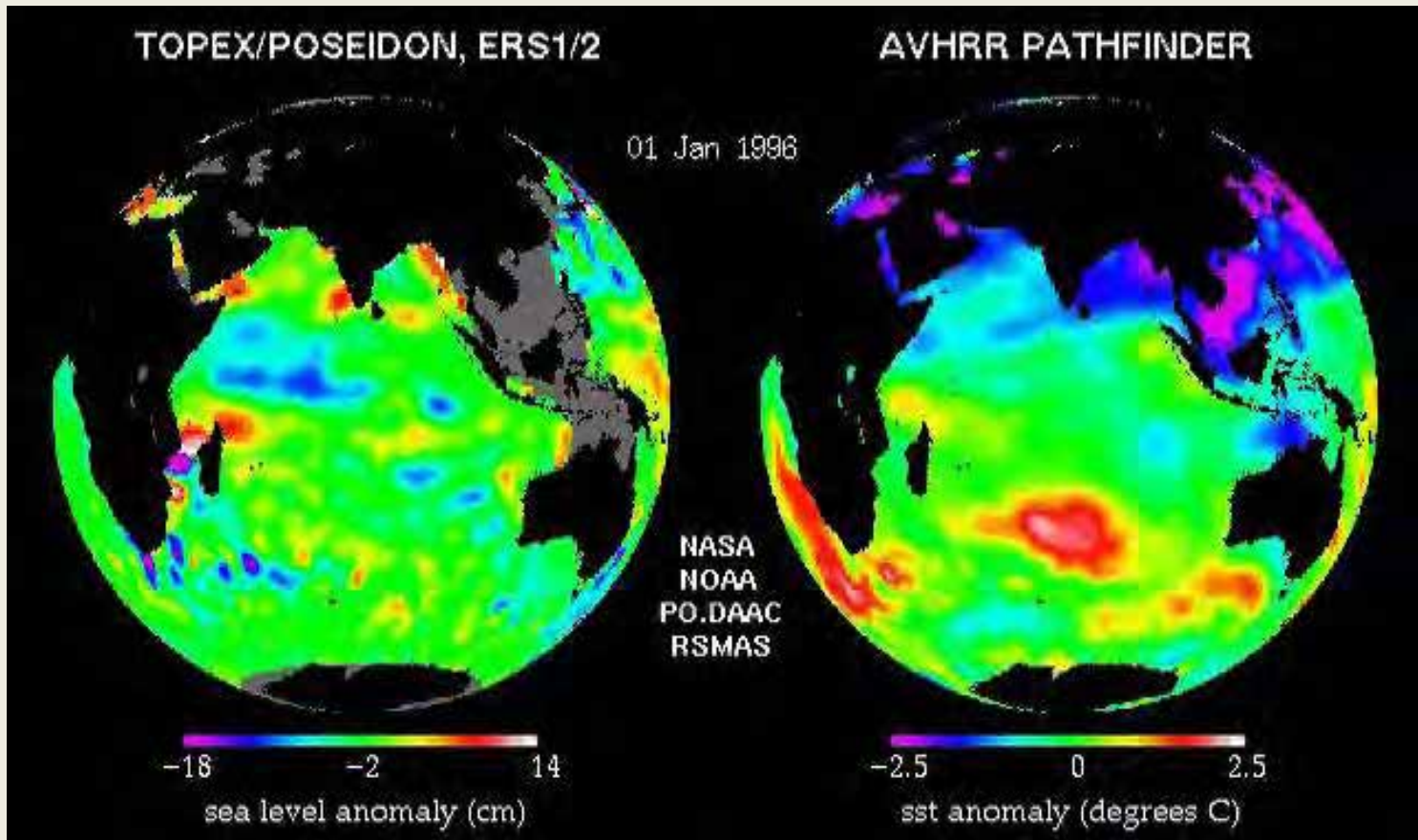


Brother of El Niño discovered in the Indian Ocean インド洋にもエルニーニョに似た現象がある

Sea level anomaly
(海面水位の偏差)

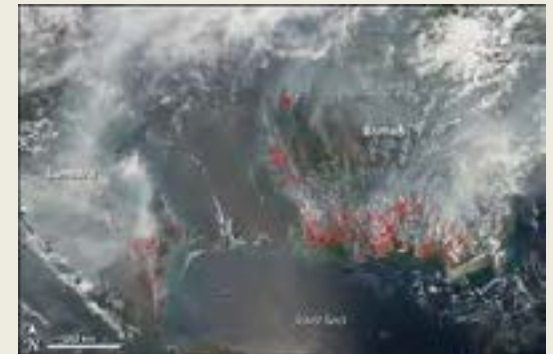
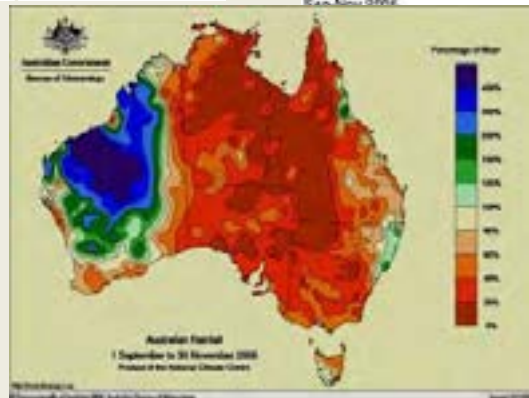
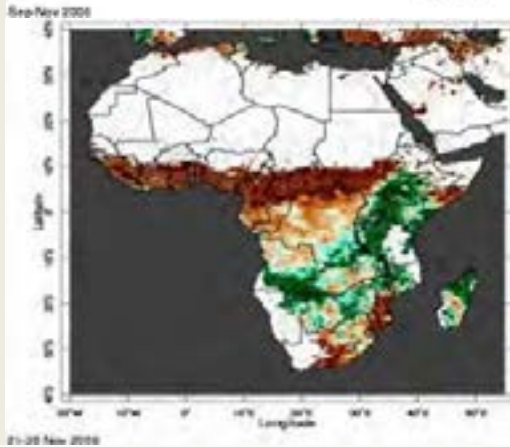
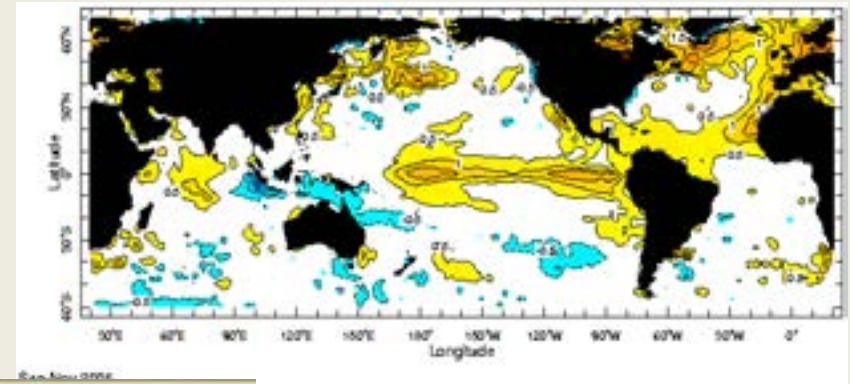
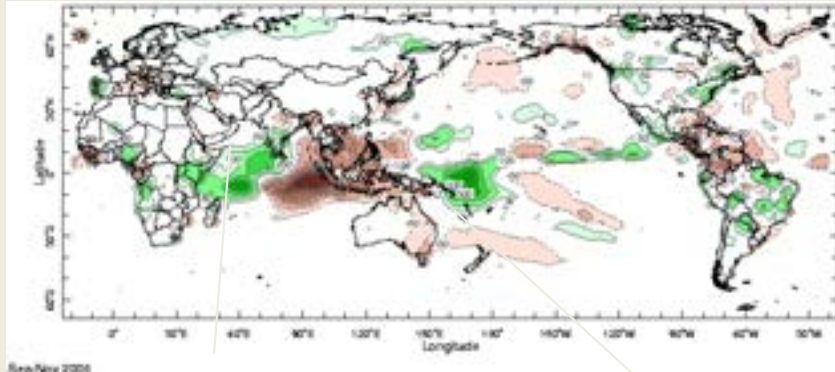
Sea surface temperature anomaly
(海面水温の偏差)



2006年のダイポールモード現象の影響

Rainfall Anomalies Sep-Nov 2006

Corresponding SST Anomalies



More than 1 million people in Kenya, Somalia and neighboring countries were affected by the flooding.

Severe drought devastated farmers in eastern Australia with the estimated loss of 8 billion AUD.

Forest fires in Borneo and Sumatra

ケニアの洪水

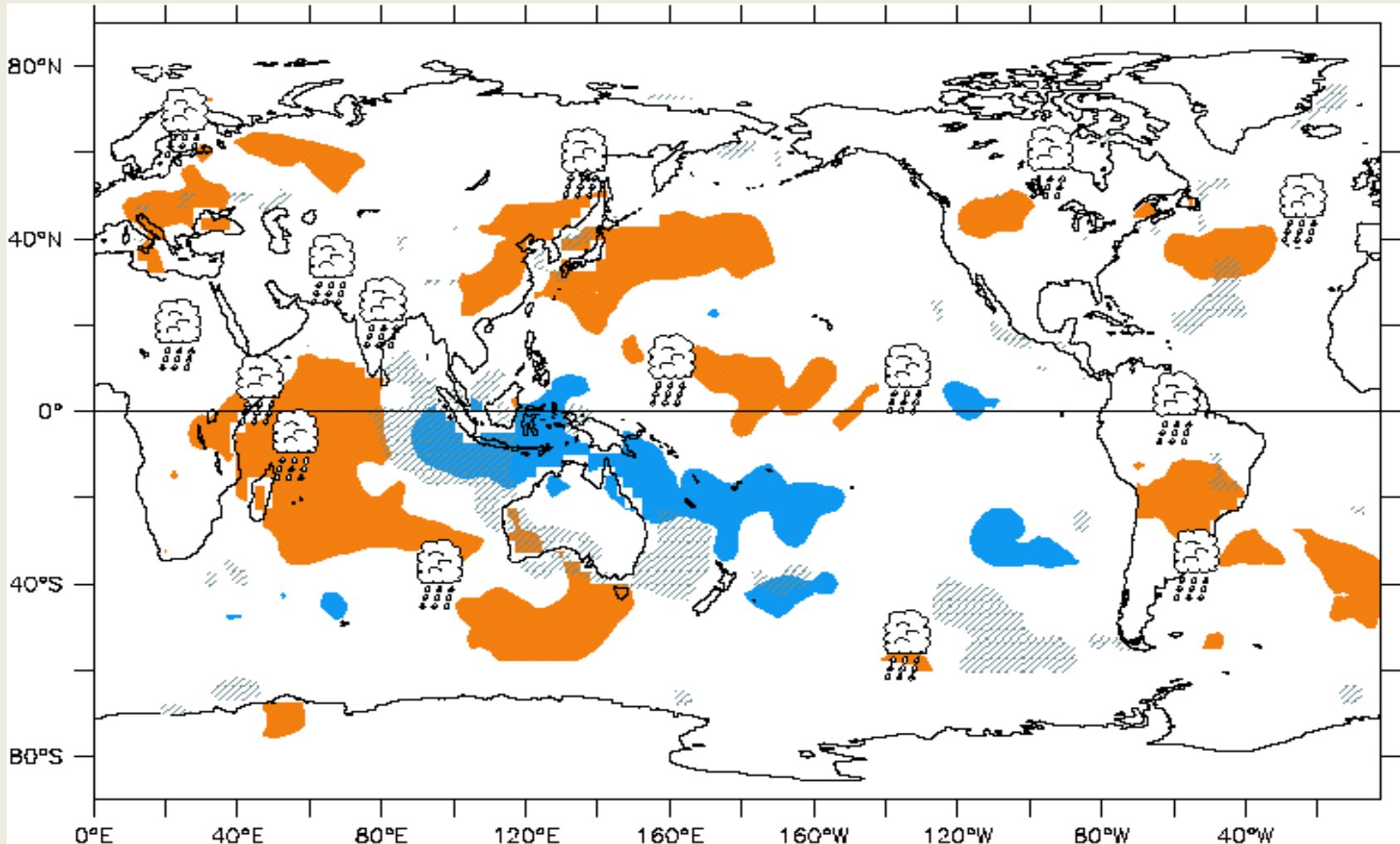
オーストラリアの干ばつ

ボルネオやスマトラの森林火災

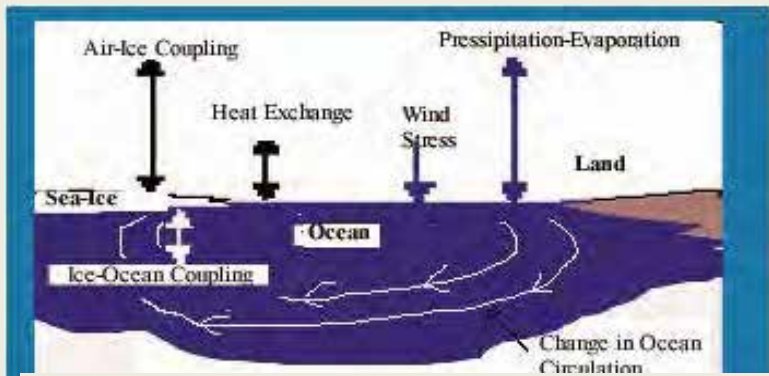
ダイポールモード現象の世界各地への影響(夏)

(Blue : cold area ; Orange : warm area)

(Shaded : dry area ; Cloud : wet area)



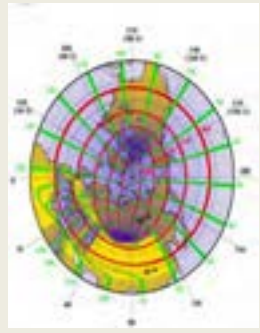
大気海洋大循環モデルを用いた気候変動予測システム (Ocean-atmosphere coupled GCM: SINTEX-F)



OCEAN: OPA8.2 ORCAR2 Grid
2°X1.5°Eq-0.5 Level 31



ATMOSPHERE: ECHAM4
T106 L19



North Pole is replaced by two land points



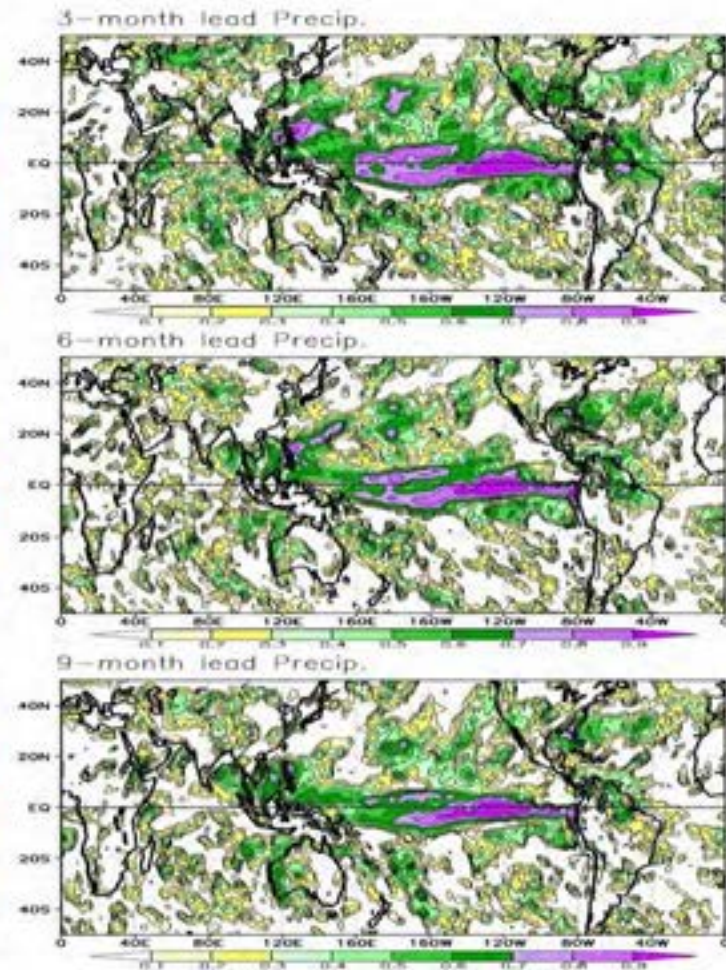
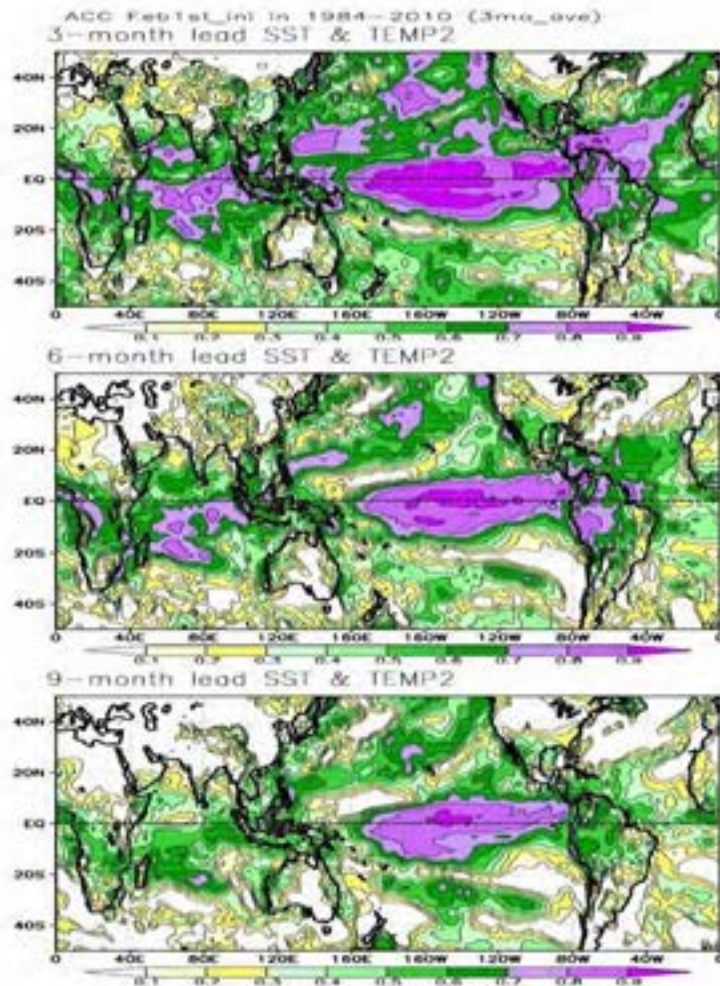
Earth Simulator

Early warning is now available experimentally!

気候変動の物理変数(気温、水温、降雨)と
その影響の早期予測が可能に

<http://www.jamstec.go.jp/frcgc/research/d1/iod/e/seasonal/outlook.html>

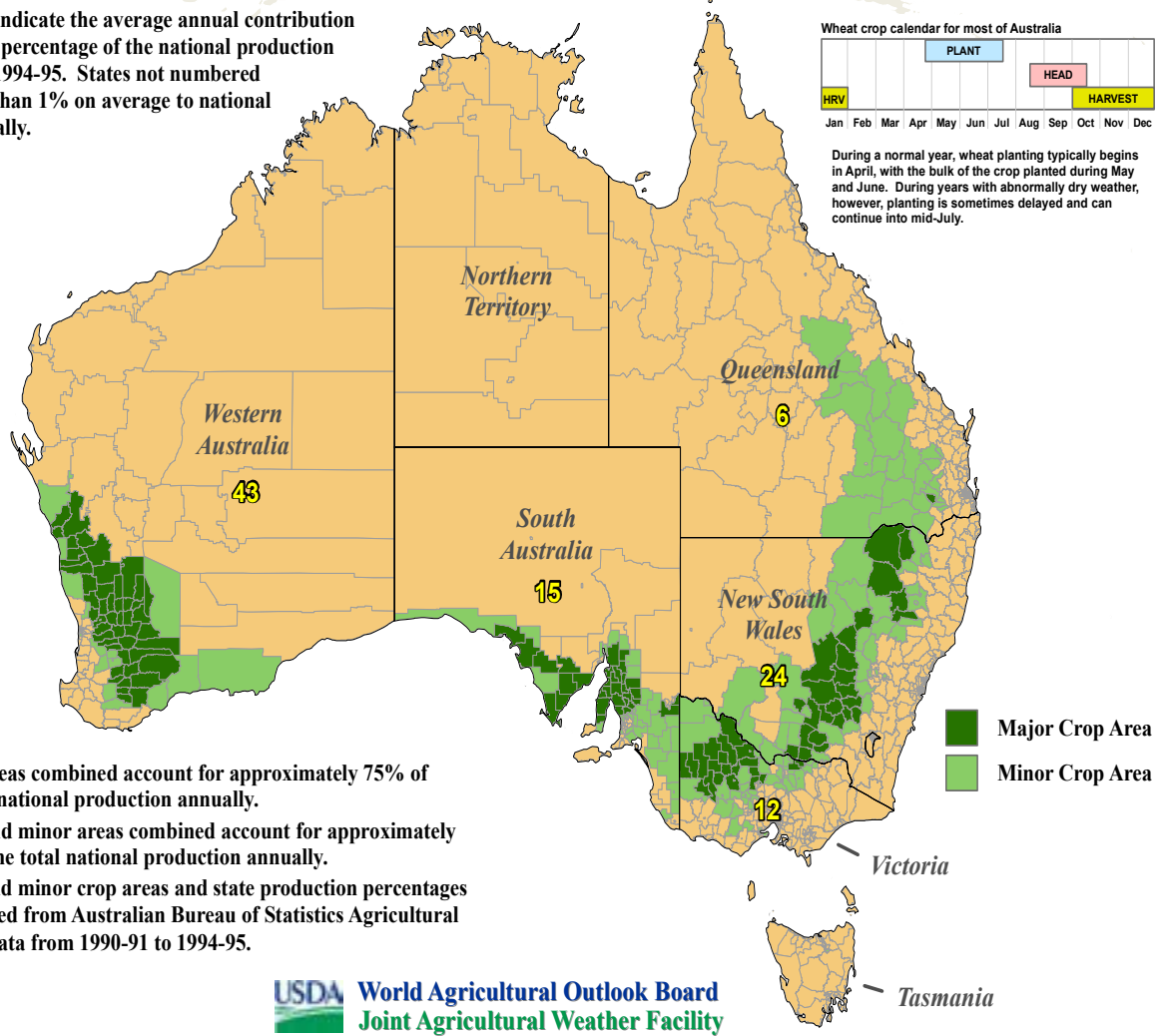
(山形 学術の動向 2015年2月号)



オーストラリアの小麦生産地

Australia: Wheat

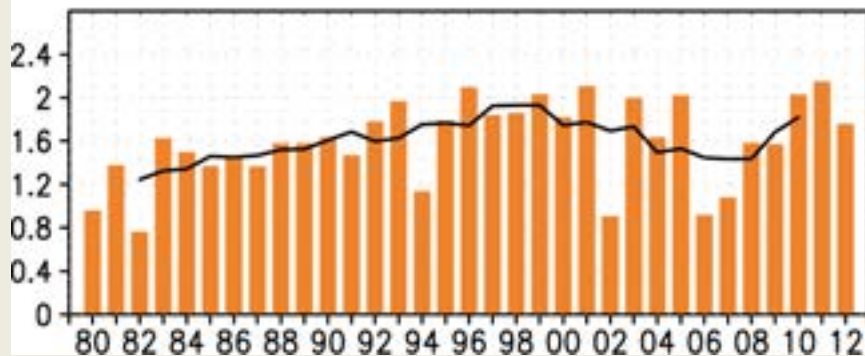
Yellow numbers indicate the average annual contribution of each state as a percentage of the national production from 1990-91 to 1994-95. States not numbered contributed less than 1% on average to national production annually.



- Major areas combined account for approximately 75% of the total national production annually.
- Major and minor areas combined account for approximately 99% of the total national production annually.
- Major and minor crop areas and state production percentages are derived from Australian Bureau of Statistics Agricultural Census data from 1990-91 to 1994-95.

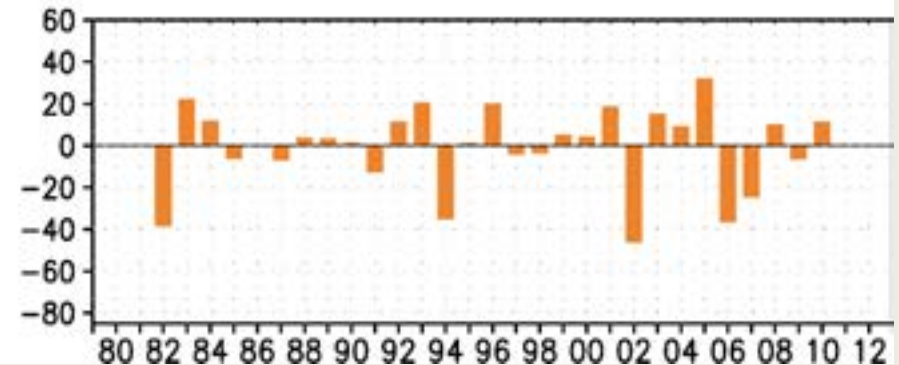
豪州の冬小麦収穫の年々変動

Winter Wheat Yield (T/Ha)



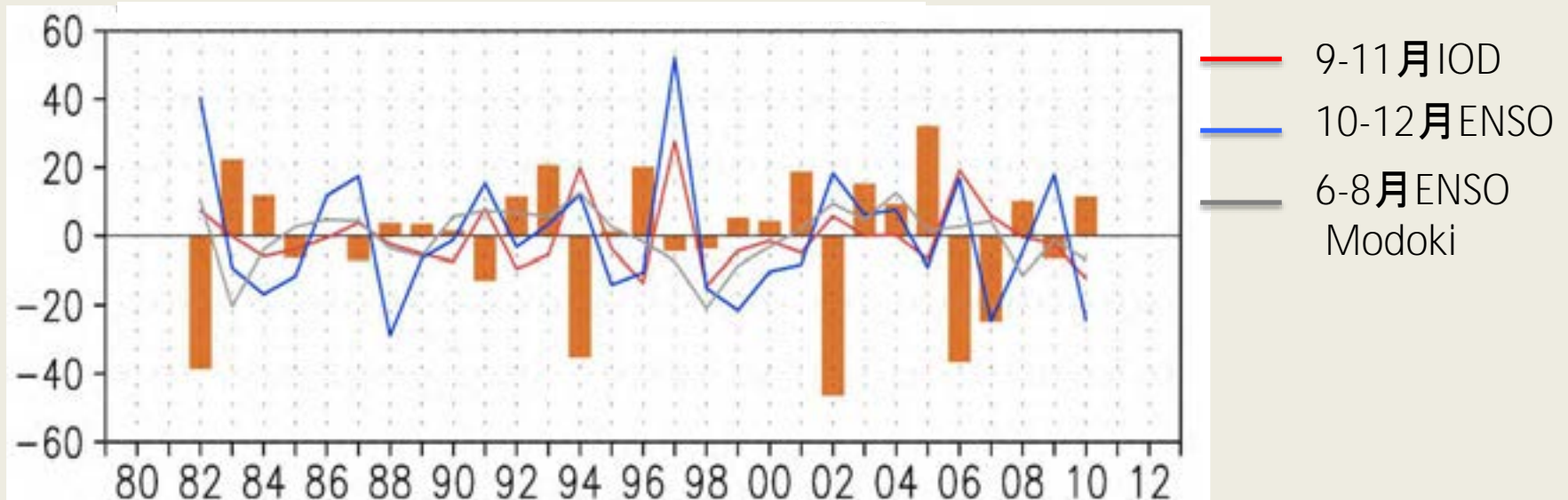
収穫

Yield Anomaly Percentage (%)



5年平均からのずれ(%)

小麦収穫と熱帯気候モードの相関関係



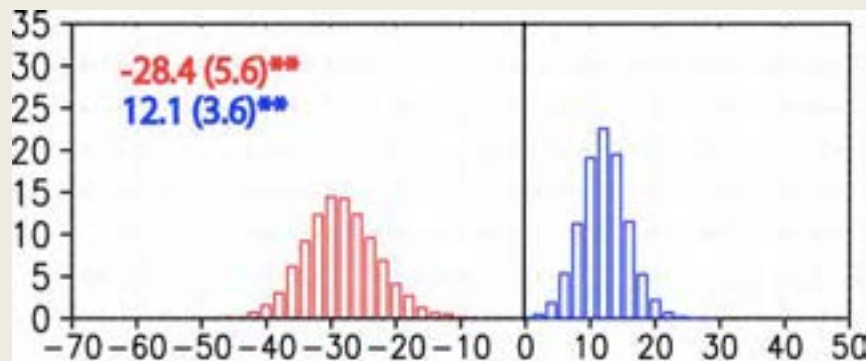
	IOD	ENSO	ENSO Modoki
収穫	-0.64**	-0.49**	-0.39*

** : 99%有意

* : 95%有意

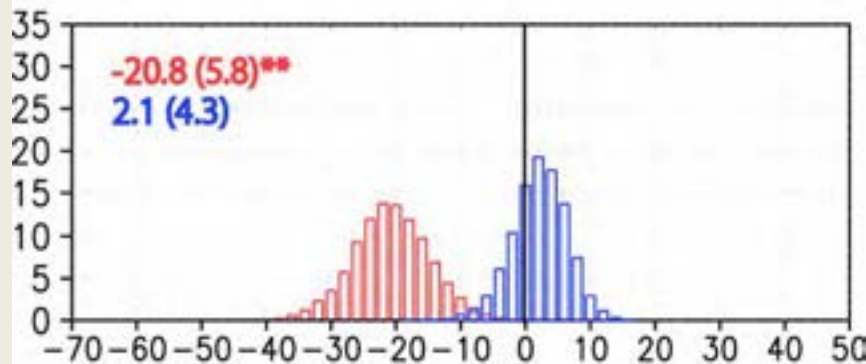
Bootstrap法による

確率分布 %

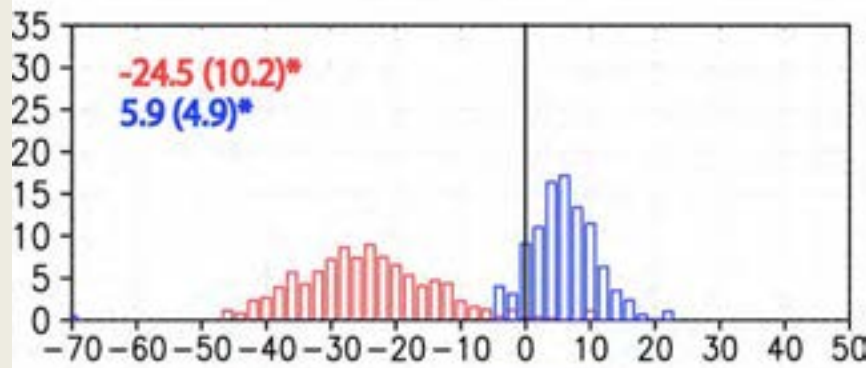


平均減収率(標準偏差)
平均増収率(標準偏差)

正と負のIOD



正と負のENSO

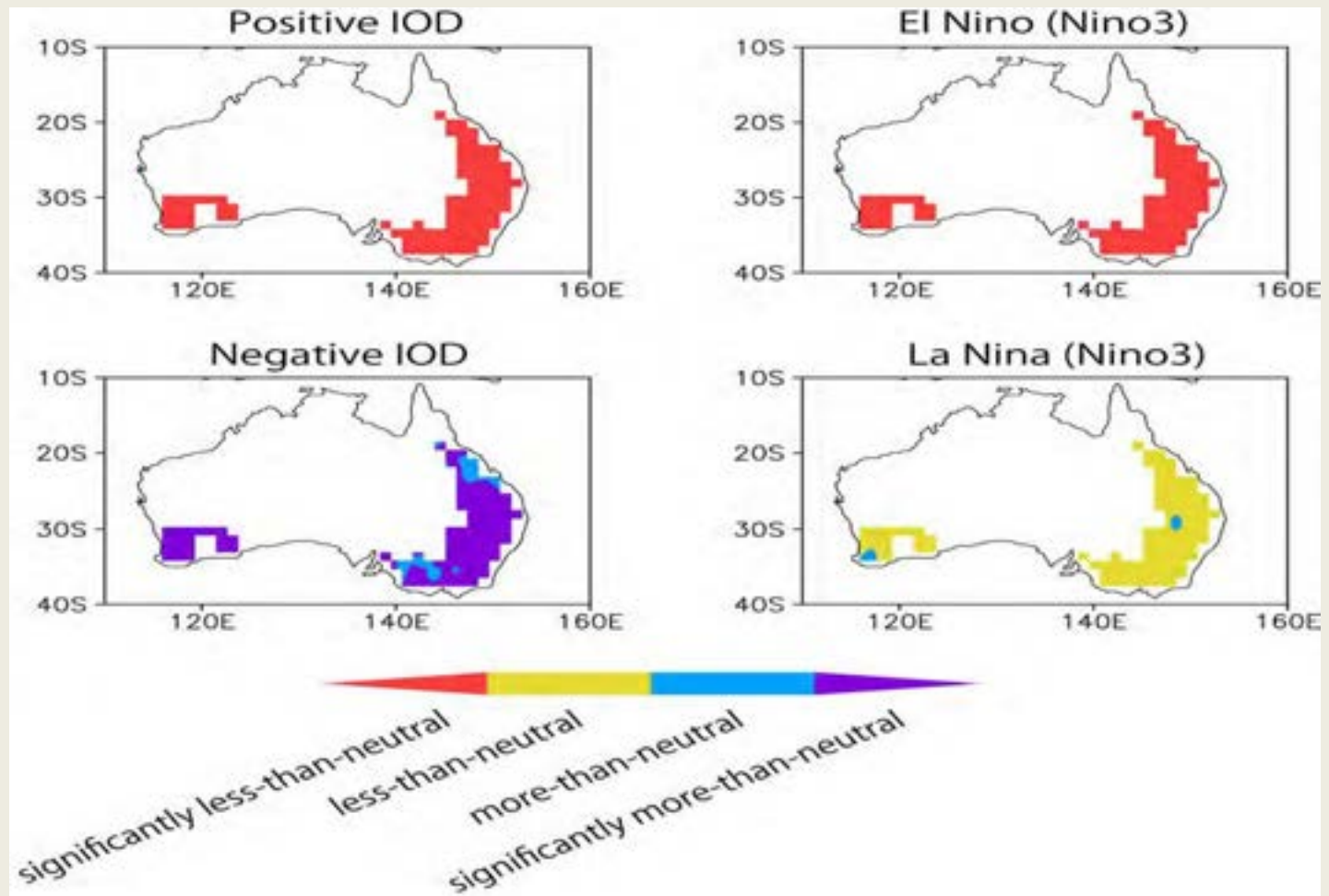


正と負のENSO Modoki

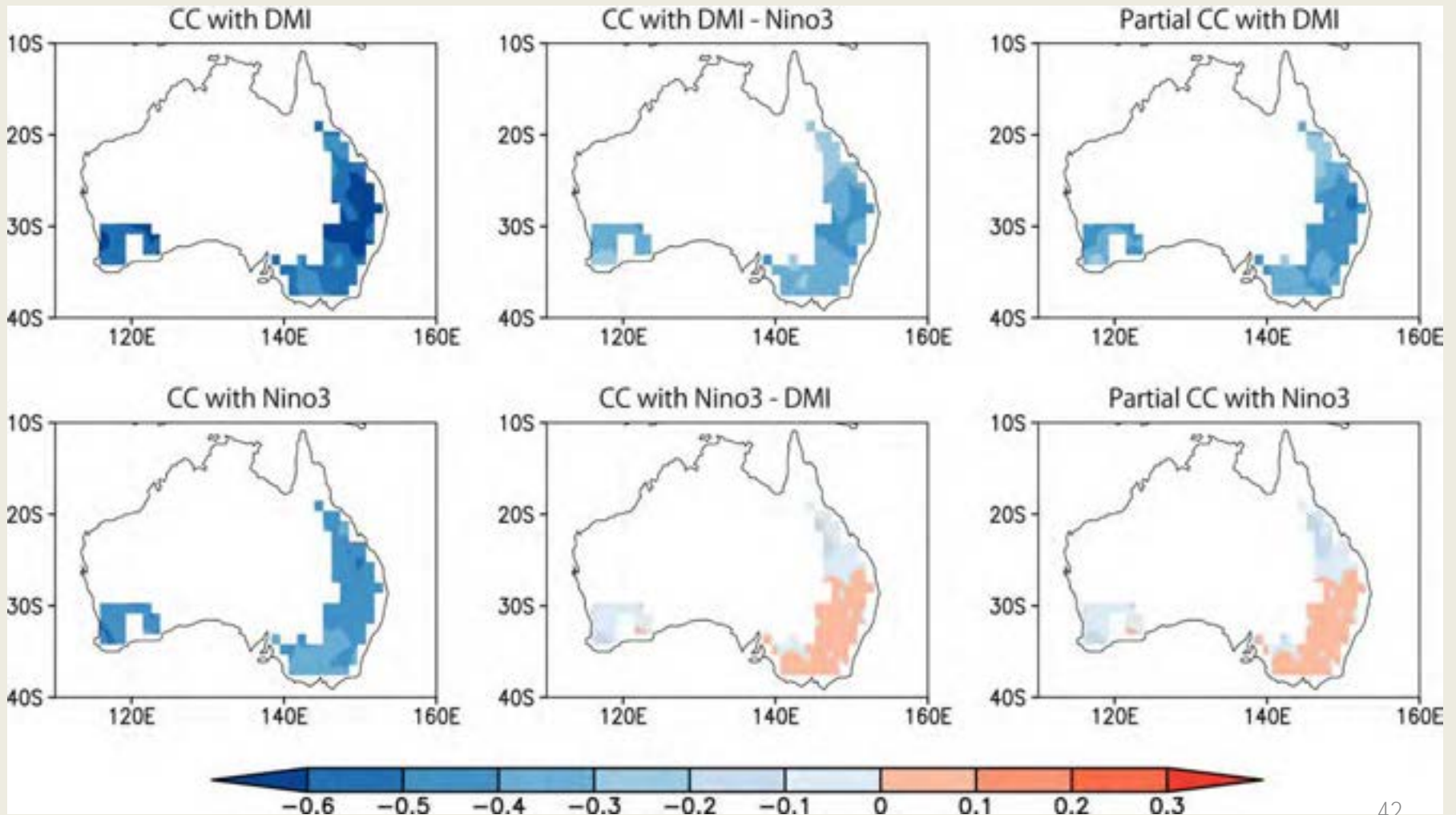
収穫の異常 (%)

Wheat yield anomaly at different phases of IOD and ENSO

オーストラリアの小麦収量変動と気候変動現象の関係
(Chaoxia Yuan and T. Yamagata 2015, Scientific Reports)



IOD is much more important than ENSO in wheat yield in Australia (C. Yuan and T. Yamagata, 2015)



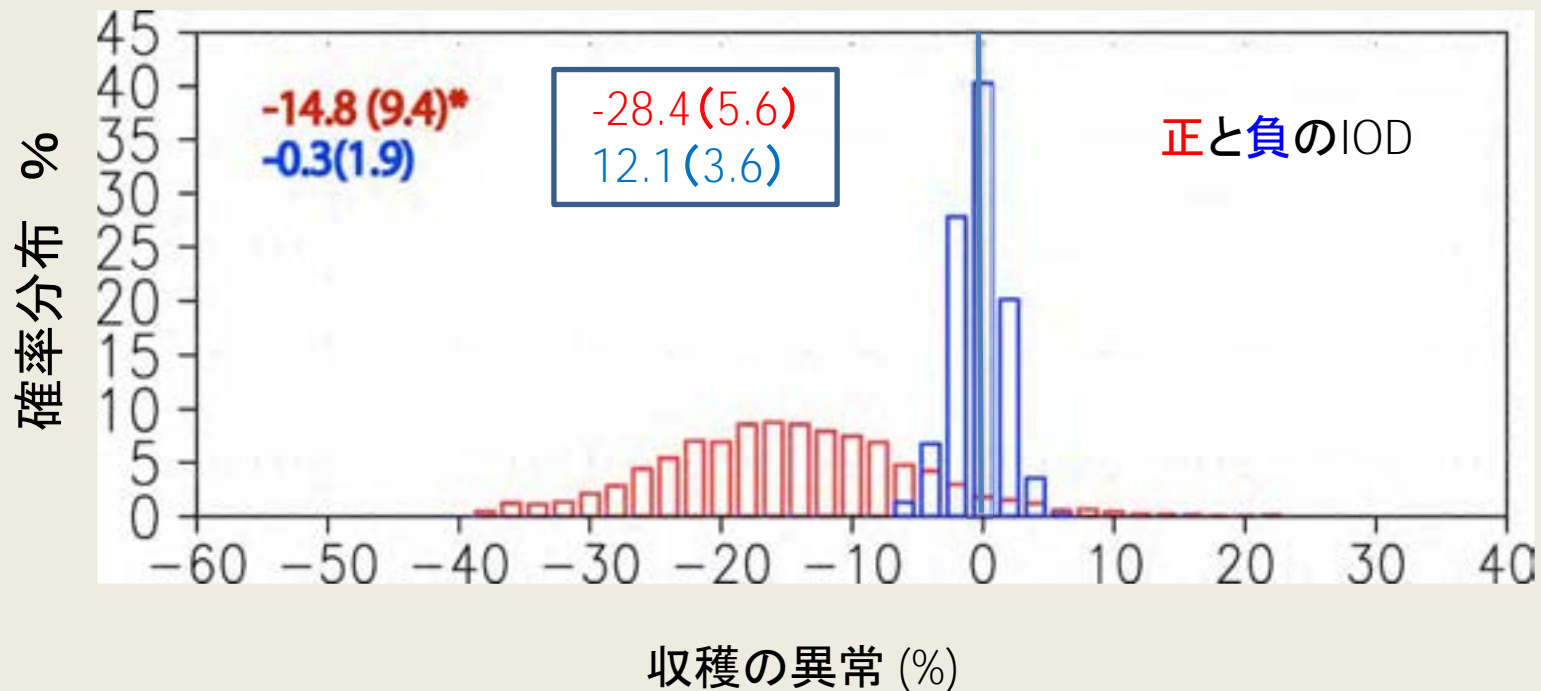
小麦収穫と熱帯気候変動現象の線形関係

(他の気候モードの影響を取り除いて解析)

	IOD / ENSO	IOD / ENSO Modoki	ENSO / IOD	ENSO Modoki / IOD
収穫	-0.41**	-0.56**	-0.08	-0.18

過去30年、IODはENSOやENSO Modokiよりも豪州の冬小麦収量に圧倒的に大きな影響を与えてきた。しかし、IODと他の気候変動現象が同じ年に起きることがあるため、本当に影響を与えている気候変動現象を見間違えてきた！！

IODの4月の気候変動予測情報を用いて 小麦収穫予測情報に変換した場合の確率分布



of Ocean and Climate Prediction to Society

海洋と気候予測システムの豊かな可能性

Our societal, economic and industrial activities are highly vulnerable to abnormal and extreme events induced by climate variations rooted in the oceans under the changing climate.

気候変化の下で進化を始めた海洋起源の気候変動現象。その結果として起きる海と空の極端現象が社会、経済、産業活動に大きな影響を与え始めた。

To mitigate impacts from such extreme events and to achieve sustainable wellness and well-being, to accelerate building an innovative ocean and climate prediction system by use of state-of-the art general circulation models harnessing the real-time satellite and *in situ* observations and the simulation technology is urgent.

その影響を緩和し持続可能な良き生を達成するにはリアルタイムの衛星及び現場観測とシミュレーション技術を統合した革新的な海洋と気候の予測システムの構築を急ぐ必要がある。

This will lead to a good practice in demonstrating an active link between the provision of services and the collection and processing of data, thus contributing to decision-making. This will contribute to <Marine Crisis Watch> in Asia and the Pacific, as well.

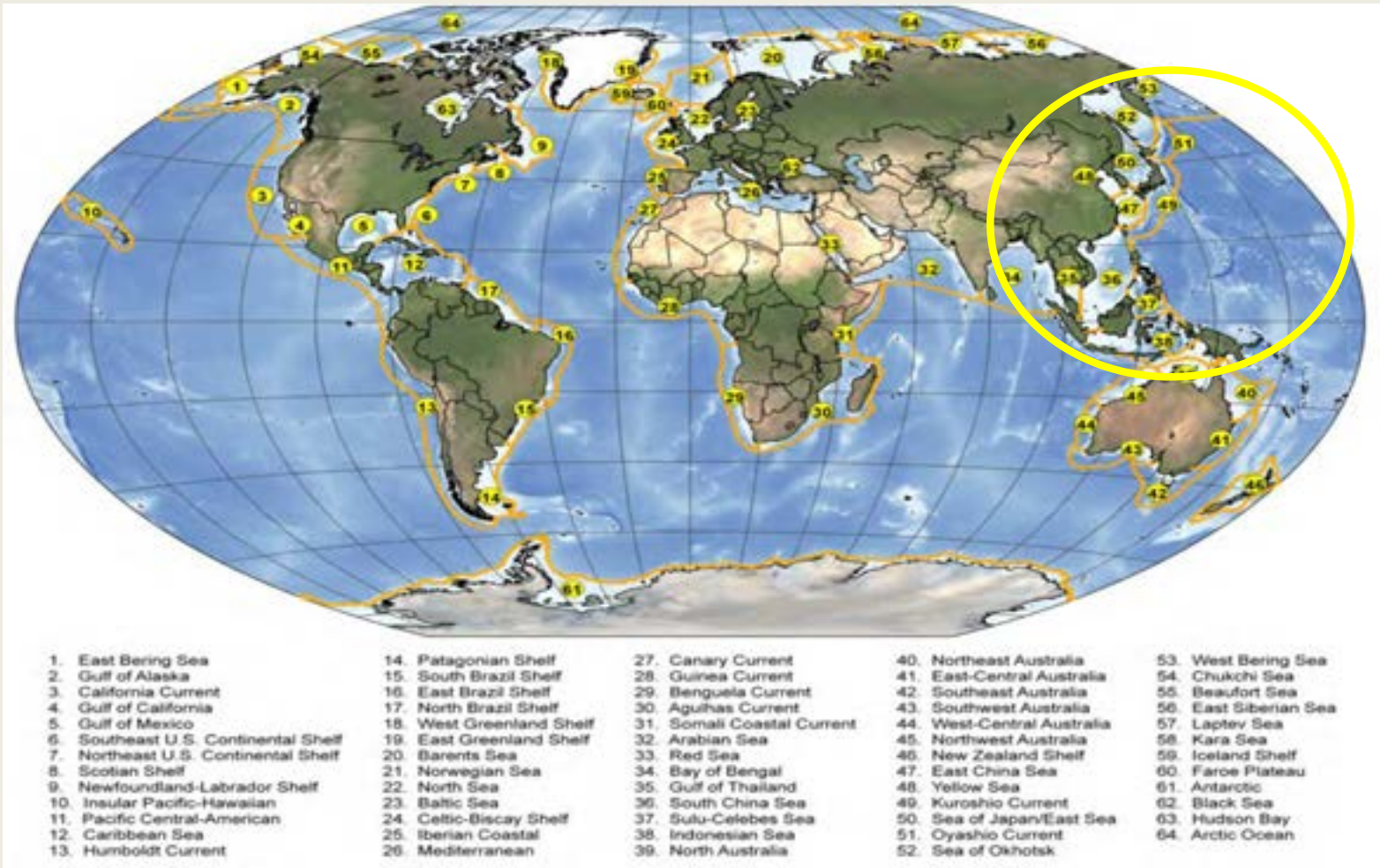
このシステムはサービスとデータ収集・処理の間の活発な交流の良き例を与え、政策決定に貢献する。これはアジア太平洋地域の<海洋危機監視>にも貢献するであろう。

New Initiative in Asia and the Pacific

- To exchange information & knowledge on the existing discipline-oriented research programs on the marginal seas in Asia & the western Pacific for integrative sustainability research program involving natural, social, economic, engineering & technological sciences.
-
- To discuss & co-design a collaborative interdisciplinary research program on the marginal seas of Asia & the western Pacific that meets the criteria of research toward global sustainability under the framework of Future Earth.

Marginal Seas in Asia and the Pacific:
 the largest hot spot in culture, history, environment,
 and industrial/trading activities

Urgent need of <Marine Crisis Watch (海洋危機監視)>



SIMSEA

Sustainability Initiative

in the Marginal Seas of South and East Asia

(<http://simseaasiapacific.org/>)

The idea was born at the 16th Meeting of ICSU RCAP (Regional Committee for Asia and the Pacific), Nov. 26 - 28, 2013, Hotel President, Seoul, Korea

Pre-scoping workshop was held at Application Lab, JAMSTEC, Feb. 27-28, 2014, Yokohama, Japan

1st SIMSEA SC at the University of the Philippines, June 30-July 1, 2014

Scoping workshop for prioritization at University of the Philippines, and 2nd SIMSEA SC Nov. 19-20, 2014

3rd SIMSEA SC at the University of the Philippines, Oct. 6-7, 2015

4th SIMSEA SC at the University of the Philippines, Mar. 21-22, 2016

SIMSEA Regional Forum at Microtel by Wyndham, Sept. 25, 2016

5th SIMSEA SC at Kuala Lumpur, Nov. 2017

Coordination and convergence

Develop an understanding of what sustainability means at the national and regional levels taking into account varying cultural contexts 国レベル、地域レベルで持続可能性の理解を進める

Develop global sustainability indicators that can guide implementation at the regional and sub-regional levels 持続可能性指標の導入

Develop strong regional representation in *Future Earth* and regional priorities that are developed through in-depth, long-term and sustained discussions アジアからの発信

Create alliances of current integrated research projects and researchers upon which to build long-term strength 現行研究プロジェクト、研究者間のネットワーク

Define clear mechanisms, such as an endorsement process, for projects to become part of *Future Earth* FEプロジェクト認証プロセスの導入

Develop incentive mechanisms to promote transdisciplinary research

Foster networks for scientists across regions, disciplinary fields and stakeholders 学際、超学際的協働の推進

Capacity development

Compile **examples of best practices of transdisciplinary research on sustainability** issues beginning with small and local scale projects that could be scaled up through programmes at the regional and national levels
超学際的研究の成功例をスケールアップ

Document case studies of successful integration and interdisciplinary work in the region and **create guidelines on how to do co-design and co-production of research** 成功事例に基づき協働ガイドラインを作成

Increase **human capacity development training programs**, through short-term workshops, exchange of graduate students, increasing the number of graduate research positions and Professorial Chairs within countries in the region 人材育成プログラムの展開

Develop mentoring of young scientists in least developed countries by more experienced researchers 途上国の若手研究者を助言するシステム

Science-policy-stakeholder interface

Develop an understanding of what the points of entry into the policy arena are 政策に結び付ける仕方の理解増進

Develop approaches and programmes to bring into dialogue groups of people who do not normally talk to each other 会話を増進するプログラムの導入

Translate and share models on how to influence policymakers - taking into account wide range of political systems and cultural settings and businesses, and sustain successful science-policy dialogues 政策担当者に影響を及ぼすモデルの共有

Create or identify science-policy platforms to effectively inform and engage decision- and policy-makers 科学者と政策担当者が協働する場の設定

Engage indigenous communities and local knowledge systems in the research process 地域共同体の参画推進



No Convention in the MSEA despite the UN Convention of Law of the Sea

-Bumpy Road but a Big Hope-

Lessons learnt from the PEMSEA* experience:

To realize a paradigm shift, to change disadvantages to advantages through

- **trust each other** with sharing a common vision first,
- **share information**
- introduce **non-binding agreements** to enhance regional cooperation
- **co-design/co-work/co-deliver for implementation**

by joint planning schemes, scaling-up processes, involvement of non-state as well as state partners (in particular, local government), and UN organizations for SDG (institutional, legislative framework, communication method, capacity building framework)

*PEMSEA:

Partnerships in Environmental Management for the Seas of East Asia (PEMSEA) is an intergovernmental organization operating in East Asia to foster and sustain healthy and resilient oceans, coasts, communities and economies across the region.