

気候変動が農作物収量に与える影響の感度分析

Sensitivity analyses of crop yields and changes in climate variables simulated with iGAEZ

辰己 賢一^{1*}, 山敷 庸亮¹, 寶 馨¹

KENICHI, Tatsumi^{1*}, YAMASHIKI, Yosuke¹, TAKARA, Kaoru¹

¹ 京都大学防災研究所

¹Disaster Prevention Research Institute, Kyoto University

気温較差 (DTR) は、平均気温の変化と同様、作物の収量に重要な影響を与える。気候学的な不確実性はしばしば、DTR の変化に対する感度分析を難しくさせてきた。本研究では、最低気温・平均気温・最高気温が作物収量に与える影響を分析することを目的とする。対象とする作物は世界の主要穀物である小麦、米、とうもろこしとし、農作物収量算定モデルによって得られた各グリッドにおける 1980-1999 年の収量値と気候値データに対して一般化加法モデルを適用して解析を行った。さらに、将来の気温較差・平均気温の変動が農作物収量に与える影響を調べるため、CMIP3 マルチモデルデータセットの SRES A2, B1 シナリオのそれぞれ 18 のモデルを使用した。これらの結果、気温較差や気温は農作物収量に有意な影響を与えるが、その影響の程度やパターンは、各作物および地域によって異なることがわかった。

キーワード: 気温較差, 気候変動, 作物収量, iGAEZ

Keywords: diurnal temperature ranges, climate change, crop yield, iGAEZ

北極海に流入する河川に対する栄養塩汚濁負荷量変化の推計と統一水質指標を用いた影響評価に関する研究 Impact assessment for rivers flowing into the Arctic Ocean by using Nutrient loading and Water Quality Index

寺本 智子^{1*}, 山敷 庸亮², 寶 馨²

TERAMOTO, Tomoko^{1*}, YAMASHIKI, Yosuke², TAKARA, Kaoru²

¹ 京都大学大学院工学研究科, ² 京都大学防災研究所

¹ Graduate School of Eng, Kyoto University, ² DPRI, Kyoto University

Nutrients carried by rivers to oceans are important indicators. Especially in the Arctic, these fluxes are important due to the large volume of inputs and the small area of the Arctic Ocean. A major issue in arctic research is how much nutrient inputs to the Arctic Ocean vary with climate change. In this study we aim (1) to estimate nutrient loading from land zone throughout international river basin using the GEMS/Water (Global Environment Monitoring System/Water) data sets for the purpose of estimating the gross nutrient loading to the marine environment, (2) to calculate Water Quality Index (WQI) for the purpose of evaluation of water quality that flows into the sea from the river, (3) to compare nutrient loading and WQI for propose of knowing the relationship between nutrient loading and single indicator of water quality index. WQI is a numeric expression used to evaluate the quality of a given water body and it was developed for the purpose of providing a tool to simplify the water quality data. It is a tool that provides meaningful summaries of water quality data that are useful to technical and policy individuals as well as the general public interested in water quality. As a result, in the some rivers which flow through the Arctic Ocean the nutrient flux is decrease comparing 1980's and 1990's even river discharge almost same value. But in the other rivers nutrient flux in 1990's is same or higher than the 1980's, the result of WQI in those rivers is the almost same as the nutrient flux result.

キーワード: 地球環境監視システム淡水部門, 水質, 汚濁負荷量, 水質指標

Keywords: GEMS/Water, Water quality, Flux, Water Quality Index

クロアチア国ザグレブ市における洪水に対する住民意識とインフラ整備に関する一考察

A Study on Citizens' Awareness of Flood Risk and Infrastructure Development in Zagreb, Croatia

木村 直子^{1*}, 山敷 庸亮¹

KIMURA, Naoko^{1*}, YAMASHIKI, Yosuke¹

¹ 京都大学防災研究所

¹ DPRI-Kyoto University

This study will explore the relation between awareness of flood risk and infrastructure development in urban area, Zagreb, Croatia. Zagreb used to be suffered from several flood damages. The flood occurred in 1964 from the Sava River is one of the largest in its modern history. Having had this bitter experience, the government led extensive development plan of infrastructure on the Sava River and the mountain rivers. Zagreb City is located between the Sava River, a tributary of the Danube River, and Medvednica Mountain. The banks, retention dams, and a drainage canal (Sava-Odra Canal) were constructed after the severe flood, and thanks to them, the city has not longer had any major floods since then. Thus, they succeeded in protecting the city and its citizens from floods. On the other hand, people's awareness of floods is toward downward tendency though they have recognized the rainfall is getting more unpredictable and it is harder than expected. From the questionnaire survey, about the 70% thanks that there will be a flood in Zagreb city in 10 years, nevertheless many of them think they have good infrastructure protection in the city. This research will try to find a meaning of studying awareness of people toward flood risks in the area with fewer floods through exploring some findings from questionnaire survey and infrastructure site visits.

キーワード: 洪水, 住民意識, インフラ整備, クロアチア

Keywords: flood, awareness, infrastructure development, Croatia

Decadal Variations of Extreme Rainfall Events in South Africa Decadal Variations of Extreme Rainfall Events in South Africa

Swadhin Behera^{1*}, Mathieu Rouault⁴, Venkata Ratnam Jayanthi¹, Tomoki Tozuka³, Toshio Yamagata²
BEHERA, Swadhin^{1*}, Mathieu Rouault⁴, Venkata Ratnam Jayanthi¹, TOZUKA, Tomoki³, YAMAGATA, Toshio²

¹Research Institute for Global Change, JAMSTEC, Japan, ²Application Laboratory, JAMSTEC, Japan, ³University of Tokyo, Japan, ⁴University of Cape Town, South Africa

¹Research Institute for Global Change, JAMSTEC, Japan, ²Application Laboratory, JAMSTEC, Japan, ³University of Tokyo, Japan, ⁴University of Cape Town, South Africa

Extreme rainfall events over the continents cause severe damages to populated regions of the world. Because of their obvious influences on the river discharges, these extreme events could also affect the water composition and marine ecosystems near the large estuaries. Therefore, it is important to study the rainfall extremes in some of the vulnerable regions of the world for better assessments of the impacts and the associated processes.

In this study, the extreme rainfall events over South Africa were examined using daily gridded rainfall data of South Africa. The rainfall distribution is subjectively separated over space and time to understand the spatio-temporal variations of the rainfall. It is found that the regions in northeast and southwest show strong decadal variations. Linear trends though apparent are not significant in these regions. Decades with persistent years of extreme rainy events are found to be mostly associated with La Nina whereas decades with persistent years of extreme dry events are mostly associated with El Nino. This suggests that the large-scale climate variations have huge impacts on the extreme events of the region and thereby the associated changes in continental ecosystem.

キーワード: extreme, rain, south africa
Keywords: extreme, rain, south africa

愛媛県西条平野沿岸域における地表水と地下水の交流動態

Dynamics of surface water and groundwater interaction at a coastal zone in Saijo plain, Ehime prefecture, western Japan

辻村 真貴^{1*}, Pankaj Kumar¹, 中野 孝教², 徳増 実³

TSUJIMURA, Maki^{1*}, Pankaj Kumar¹, NAKANO, Takanori², Minoru Tokumasu³

¹ 筑波大学, ² 総合地球環境学研究所, ³ 愛媛県西条市役所

¹University of Tsukuba, ²Research Institute of Humanity and Nature, ³Saijo City Office, Ehime Prefecture

An interaction process of surface water and groundwater was investigated using a multi-tracer approach at a coastal zone of Saijo plain, Ehime prefecture, Shikoku island, Japan. The surface water and the groundwater were sampled in an alluvial fan and a coastal area, and the inorganic constituents concentrations, CFCs concentrations, stable isotopes of hydrogen and oxygen, strontium isotopes were determined for those samples. The three groundwater wells at the coastal region were especially monitored according with tidal fluctuations of the ocean. The diurnal variation of the tracing elements of the groundwater was explained by the hydrological processes and the geochemical processes under the effect of the tidal fluctuation.

キーワード: 塩水進入, 扇状地, 沿岸域, 地下水

Keywords: sea water intrusion, alluvial fan, coastal region, groundwater

Spatial patterns of tropical OLR intraseasonal anomalies, as revealed by a self-organizing map.

Spatial patterns of tropical OLR intraseasonal anomalies, as revealed by a self-organizing map.

Pascal Oettli^{1*}, Tomoki Tozuka¹, Takeshi Izumo¹, Toshio Yamagata²

OETTLI, Pascal^{1*}, TOZUKA, Tomoki¹, Takeshi Izumo¹, YAMAGATA, Toshio²

¹The University of Tokyo, ²Application Laboratory, JAMSTEC

¹The University of Tokyo, ²Application Laboratory, JAMSTEC

The Madden-Julian oscillation (MJO) is the dominant mode of the intraseasonal variability in the tropical atmosphere. This mode is characterized by an easterly propagation of moist convection and atmospheric circulation anomalies across the Indian and western Pacific oceans. The most commonly used method to depict the spatio-temporal evolution of the MJO is to perform an empirical orthogonal function (EOF) analysis on filtered outgoing longwave radiation (OLR, used as a proxy of the convection) and zonal wind. This method is efficient, but the first two leading modes, used to depict the MJO activity, are constrained by both linearity and orthogonality.

A non-linear classification method, the self-organizing map (SOM), is introduced, as a supplement to the EOF. The SOM is applied on OLR intraseasonal anomalies (20-100 days band-pass filter) within the tropical region over 1980-2009. A 4x4-node Kohonen map is used to describe intraseasonal convection spatial patterns. The 16 nodes capture the different MJO phases. Using the SOM to describe the MJO is a new approach, and seems to provide more temporal and spatial information on MJO activity and seasonality?.

For each node, the tropical and subtropical convection is analyzed. Results show the delayed effect of the MJO on subtropical atmosphere dynamic and rainfall. They also confirm that both intraseasonal and interannual variability in the tropics influence subtropical climate. This emphasizes the need for a better understanding of the interactions between tropics and subtropics to enhance numerical modeling and forecasting.

キーワード: Madden-Julian Oscillation, Self-Organizing Map, Intraseasonal variability

Keywords: Madden-Julian Oscillation, Self-Organizing Map, Intraseasonal variability

Trajectory Modelling of Marine Debris Drifting at Bali Straits Trajectory Modelling of Marine Debris Drifting at Bali Straits

Farica Edgina Yosafat^{1*}, Ivonne Radjawane², Totok Suprijo²
Farica Edgina Yosafat^{1*}, Ivonne Radjawane², SUPRIJO, Totok²

¹Graduate School of Earth Sciences, Institute of Technology Bandung, ²Faculty of Earth Sciences and Technology, Institute of Technology Bandung

¹Graduate School of Earth Sciences, Institute of Technology Bandung, ²Faculty of Earth Sciences and Technology, Institute of Technology Bandung

Marine debris is a global problem that affects everything: from environment to economy, from fishing and navigation to human health and safety. Marine debris is a serious problem at west coast of Bali, Indonesia. Seasonal marine debris from Bali Strait stranded at the west coast of Bali Island during January until April, when northwest monsoon wind blows over the straits. The drifting of marine debris at the Bali Straits was simulated in this study by using a couple model of hydrodynamic and particle trajectory. The results of hydrodynamic model are verified with observation data of ocean currents and water elevation. The discrepancies between simulation result and data is less than 10%, therefore the hydrodynamic model is able to simulate current circulation in Bali Strait. Simulation result also shows that marine debris from east coast of Java drifts along the west coast of Bali and stranded at Kuta coast, which is a famous tourism spot. It is concluded from this study that marine debris stranded at the west coast of Bali is seasonal marine debris and it comes from east coast of Java facing the Bali Strait.

キーワード: hydrodynamics, particle tracking, monsoon, marine debris, trajectory, Bali strait

Keywords: hydrodynamics, particle tracking, monsoon, marine debris, trajectory, Bali strait

河川が東京湾の循環場に与える影響

Impacts of river discharge on the circulation in Tokyo Bay

盧麗鋒^{1*}, 木田新一郎¹, 高橋桂子¹

LU, Li-Feng^{1*}, Shinichiro Kida¹, Keiko Takahashi¹

¹ 独立行政法人海洋研究開発機構

¹ Japan Agency for Marine-Earth Science and Technology

Tokyo Bay is a semi-closed bay which is surrounded by several metropolis including Tokyo City as well as a number of industrial areas. Since it has a close relationship with many human activities, a lot of observations and modeling efforts have been made within this area. Nevertheless a further understanding of current structure is still necessary. In our study, a hydrostatic, incompressible, z-level model ? MSSG model is used to simulate the variations of circulation in the Tokyo Bay. The model is driven by the monthly mean climatological data as well as four major river discharges, including Tama River, Tsurumi River, Arakawa River, and Edogawa River. And the impacts of these rivers on the circulation in Tokyo Bay are discussed in our study.
Keywords: river discharge, circulation, Tokyo Bay

東京湾への放射性粒子状物質の輸送評価

Evaluation of Radioactive sediment transport in Tokyo Bay released from TMR

山敷 庸亮^{1*}

YAMASHIKI, Yosuke^{1*}

¹ 京都大学防災研究所, ² 海洋研究開発機構 アプリケーションラボ

¹Disaster Prevention Research Institute Kyoto University, ²APL JAMSTEC

東京電力福島第一原子力発電所所湖により主に 2011 年 3 月 21/22 日に東京大都市圏に降り注いだ放射性核種は水文プロセスにより蓄積され、東京湾に注ぎ込む。江戸川・荒川など主な河川で懸濁態物質による輸送がなされると予想され、河道において河床に堆積し、河口まで輸送される。本研究においては、流域・閉鎖性水域統合モデル Hydro3D を用いての数値計算を紹介する。3 つの主な核分裂生成物質 FP(Cs137, Cs134, I131) について、文部科学省が 9 月に実施した航空機による空間線量計測結果を元に初期条件を逆推定して計算を行なった。FP の輸送にはオイラー型表面流溶存態・懸濁態輸送モデル(地表水・土壌)と、ラグランジュ粒子 FP 輸送モデルの両者を用いて計算を行なった。結果それぞれの流域において放射性核種の集積が見られた。河口における粒子の凝集沈殿に関しては塩分濃度と代表粒径を用いたモデル化を行なった。東京湾に流入した FP は三次元閉鎖性水域モデルと底泥輸送モデルにより移送される。数値計算によると 3 年間の間に主に Cs137/Cs134 の影響により東京湾の放射性核種は増加する(I131 は 2 ヶ月以内に環境影響が極端に減少する)。江戸川・荒川河口の高線量地の他に小櫃川河口において比較的高い濃度が予測された。

キーワード: 核分裂生成物, 放射性粒子状物質, 東京湾, 東京都市圏, 水文サイクル

Keywords: Fission Products, Radioactive sediment, Tokyo Bay, TMR, Hydrological Cycle

44年間の太陽彩層シノプティック観測データアーカイブ Data archiving of 44-year synoptic observation of solar chromosphere

北井 礼三郎^{1*}
KITAI, Reizaburo^{1*}

¹ 京都大学・理・附属天文台

¹ Kwasan and Hida Observatories, Kyoto University

太陽活動は11年で周期的に変動することが知られている。ところが、その変動の振幅は一定ではなく、長期的な変動を受けている。この太陽活動の長期的な変動が、地球気候変動の一因である可能性が示唆されている。京都大学では、1926年 - 1969年の期間、太陽全面のCaIIK線単色像観測を継続的に実施した。すべて乾板データで保管されている。我々は、この乾板データをデジタルアーカイブ化し、CaIIK線で見た太陽彩層活動の長期的な変動を明らかにする研究を始めている。この計画は、(1)すべての観測乾板のメタデータベースを作成し、IUGONET (Inter-university Upper atmosphere Global Observation NETwork) を介して公開する。(2)全乾板データをデジタルスキャンし、画像データベースとして公開する。(3)太陽黒点相対数と彩層活動との相関を調査して太陽周期活動の成因を探ることを第一主眼としている。更に他の分野への応用として(4)CaIIK強度変動を、地球に降りそそぐ太陽紫外線照射量のProxyとして利用し、地球上層大気加熱の長期変動の基礎データとする。(5)このデータをもとに地球大気加熱機構を研究するという事も視野に入れている。講演では、この計画の進捗状況を報告し、これからの研究の見通しを世界の研究動向と合わせて議論する。太陽研究者側の小報告を地球科学専門研究者の視点から議論、示唆を頂けることを願っている。

キーワード: 太陽活動, 彩層, 紫外線照射, 上層大気加熱

Keywords: solar activity, chromosphere, UV irradiation, Upper atmosphere heating

福島第一原発から放出された Cs-134 と Cs-137 の福島県内河川水における移行挙動 Migration behavior of Cs-134 and Cs-137 derived from the Fukushima Daiichi NPP in river systems from Fukushima Prefecture

長尾 誠也^{1*}, 金森正樹², 落合伸也¹, 岩田雅光³, 早川和一⁴, 山本政儀¹

NAGAO, Seiya^{1*}, Masaki Kanamori², Shinya Ochiai¹, Masamitsu Iwata³, Kazuichi Hayakawa⁴, Masayoshi Yamamoto¹

¹ 金沢大学環日本海域環境研究センター, ² 金沢大学大学院自然科学研究科, ³ アクアマリンふくしま, ⁴ 金沢大学医薬保健研究域薬学系

¹Institute of Nature and Environmental Technology, Kanazawa University, ²Graduate School of Nature and Engineering Science, Kanazawa University, ³Aquamarine Fukushima, ⁴Institute of Medical, Pharmaceutical and Health Sciences, Kanazawa University

Nuclear accident at the Fukushima Daiichi Nuclear Power Plant (NPP) was occurred after the 2011 Tohoku Earthquake and Tsunami. About 15 PBq of radionuclides was released from the Fukushima Daiichi NPP due to vent and hydrogen explosion. The MEXT reported total surface deposition of Cs-134 and Cs-137 inside 80 km zone of Fukushima Daiichi NPP. The surface deposition reveals significance external radioactivity in a northwest zone from the NPP, about 20 km in wide and 50 to 70 km in length. River systems may play important role in dispersion of radionuclides in watershed environment. Therefore the short and long-term dispersion of radioactive cesium (Cs) has to monitor at upstream and downstream, and assesses the impact of radioactive pollution on living species in terrestrial and coastal marine environments. The aim of this study is to describe spatial distribution of radioactivity of Cs-134 and Cs-137 in river systems in Fukushima Prefecture during May to December in 2011.

The 20 L of river water samples were collected at monitoring stations in five river systems, Abukuma River, Uta River, Niita Rver, Natsui River and Same River in May, July, September and December in 2011. Watershed area is 5400 km² for the Abukuma River, but other rivers has small watershed from 106 to 749 km². The Cs-134 and Cs-137 were separated by coprecipitation with AMP and measured by gamma-ray spectrometry using low BKG Ge detector at LLRL and Ogoya URL of Kanazawa University for 1-3 days.

The radioactivity of Cs-137 ranges from 0.23 Bq/kg to 4.18 Bq/kg in May 20, from 0.064 to 1.54 Bq/kg in July 12-13 and from 0.02 to 0.79 Bq/kg in September 13-14. The variation pattern is in consistent with spatial distribution of Cs-134 and Cs-137 in surface soil in Fukushima Prefecture. All of the samples indicate Cs-134/Cs-137 ratio is about 1.0 so that radiocesium in surface waters transported to all of the stations. The radioactivity of Cs-137 decreases at each monitoring station during May-September except for the downstream of Abukuma River. In this study, we will describe the spatial and temporal variations in of Cs-134 and Cs-137 in the river systems in addition with the December data, and discuss with the factors controlling the variations of radiocesium in river watershed environments.

キーワード: 放射性セシウム, 河川水, 移行動態, 福島第一原発事故

Keywords: Cs-137, river water, migration, Fukushima NPP accident

Interannual chlorophyll variability in the Northeastern Tropical Pacific Ocean: An eddy-resolving ocean model study

Interannual chlorophyll variability in the Northeastern Tropical Pacific Ocean: An eddy-resolving ocean model study

笹井 義一^{1*}, 佐々木英治¹

SASAI, Yoshikazu^{1*}, Hideharu Sasaki¹

¹ (独) 海洋研究開発機構

¹ Japan Agency for Marine-Earth Science and Technology

An eddy-resolving coupled physical-biological ocean model has been employed to investigate the seasonal and interannual variability of the chlorophyll in the northeastern tropical Pacific during 2000-2007. The seasonal variability of the surface chlorophyll concentration in the model agrees well with satellite ocean color data, except for the equatorial region. High chlorophyll levels off the Gulf of Tehuantepec, Papagayo, and Panama in winter and in the Costa Rica Dome in summer are well reproduced. Production in these areas is controlled by the supply of nitrate rich-waters through vertical mixing and coastal and open ocean upwelling. The variability of the thermocline depth is strongly connected to the seasonal variability of surface chlorophyll. El Nino Southern Ocean (ENSO) variability has a marked effect on the marine ecosystem. The model reproduces the variability of chlorophyll corresponding to the observed ENSO variability. During cold SST anomaly phases (2000, 2001 and 2007), the chlorophyll concentration is considerably higher than other years (2002-2006). Chlorophyll variance is largest off the Gulf of Papagayo and over the Costa Rica Dome where the changes to chlorophyll levels are related to changes in the supply of nitrate rich-waters through vertical mixing and upwelling.

Keywords: Marine ecosystem, Northeastern Tropical Pacific, ENSO, High-resolution ocean model

茨城県つくば市における大気放射能観測 福島事故による大気エアロゾル、降下物の変動の実態

Observation of atmospheric radioactivity in Tsukuba-Impacts on aerosol and deposition by the Fukushima nuclear accident

五十嵐 康人^{1*}

IGARASHI, Yasuhito^{1*}

¹ 気象研究所 環境・応用気象研究部

¹ Atmospheric Environment & Applied Meteorology Research Department, Meteorological Research Institute

気象研究所では、Bikini 事件を契機として、1950 年代から 50 年以上の長期にわたり大気・海洋の人工放射性核種の濃度変動の実態とその変動要因を明らかにするために、環境影響が懸念されている長寿命の核種について観測を続けてきた。特に人工放射性核種の月間降下量 (^{90}Sr および ^{137}Cs) の長期観測記録は世界で最も長く、2012 年の 3 月には、1957 年 4 月以来満 55 年となる。この期間には、1960 年初頭の米ソによる大規模大気圏内核実験、1970~80 年代初期までの中国の大気圏内核実験、1986 年のチェルノブイリ事故などの出来事が発生し、それらにより放出された人工放射性核種がどの水準で我が国の大気環境に影響を与えたのかが、鮮明に記録されてきた。2011 年 3 月の大震災により発生した東京電力第一福島原子力発電所事故は、あらたに大気環境へチェルノブイリ事故の数分の一に達する放射性物質を放出・付加した。この大規模な汚染によって、大気環境中での人工放射性核種の濃度水準も大きな影響を受けた。気象研究所では、大気試料の採取及び試料中の放射能の分析を事故前後で継続した。本講演では、福島事故により長期の時系列データに加えられた影響等について講演する。

キーワード: 人工放射能, 大気試料, 福島原発事故, 大気降下物

Keywords: Anthropogenic radioactivity, Atmospheric samples, the Fukushima accident, Atmospheric deposition

Transport simulations of Cs137 from the shelf to open ocean around Fukushima Transport simulations of Cs137 from the shelf to open ocean around Fukushima

Yasumasa Miyazawa^{1*}, Yukio Masumoto¹, Sergey M. Varlamov¹, Toru Miyama¹, Masayuki Takigawa¹, Makio Honda¹, Toshiro Saino¹

MIYAZAWA, Yasumasa^{1*}, Yukio Masumoto¹, Sergey M. Varlamov¹, Toru Miyama¹, Masayuki Takigawa¹, Makio Honda¹, Toshiro Saino¹

¹JAMSTEC

¹JAMSTEC

We have conducted simulations of the Cs137 oceanic dispersion process from March to May 2011, focusing on transport processes from the shelf to open ocean and source information. Dispersion due to direct emission was limited near the coast for the period from March to the beginning of April, and extended to open ocean in the middle of April. Atmospheric deposition was dominant for oceanic dispersion for the period from March to the beginning of April. Estimation of the source information using the observation data could be considerably influenced by simulated ocean currents and error specification of urgent monitoring data. Comparatively large direct emission amount estimated as compared to other models suggests more transport of Cs137 from the shelf to open ocean simulated by JCOPE-T than by the other models

キーワード: Cs137, Fukushima, oceanic dispersion, simulation, observation

Keywords: Cs137, Fukushima, oceanic dispersion, simulation, observation

Modeling the oceanic flow field for investigating the dispersion of radioactive water along Fukushima coast Modeling the oceanic flow field for investigating the dispersion of radioactive water along Fukushima coast

Shinichiro Kida^{1*}, YOUNGJIN CHOI¹, Keiko Takahashi¹
KIDA, Shinichiro^{1*}, CHOI, YOUNGJIN¹, TAKAHASHI, Keiko¹

¹Earth Simulator Center, JAMSTEC

¹Earth Simulator Center, JAMSTEC

A numerical model is developed at the Earth Simulator Center, JAMSTEC, to investigate the dispersion of radioactive water released to the coast waters of Fukushima. This model is based on a three-dimensional particle random-walk model for simulating the dispersion of radioactive water and an ocean general circulation model for simulating the background oceanic flow field. While we were successful at modeling the dispersion of radionuclides similar to that observed, we also find the spatial variability in the oceanic flow field quite sensitive to model settings. Qualitatively, we find the radionuclides to be trapped mostly along the coast. However, differences in surface wind stress and heat flux products as well as maximum model depth gave different results. We will suggest that the differences in the development of coastal currents, meso-scale open oceanic eddy, and surface mixing to be the primary causes of the differences.

キーワード: ocean modeling, coastal currents, meso-scale eddies
Keywords: ocean modeling, coastal currents, meso-scale eddies

2006年IOD発生期の南部熱帯インド洋の冷却機構 Cooling Processes in the Southeastern Tropical Indian Ocean during the Initiation Period of the 2006 IOD

松原 弘典¹, 升本 順夫^{2*}

MATSUBARA, Kosuke¹, MASUMOTO, Yukio^{2*}

¹ 東京大学大学院理学系研究科, ² 海洋研究開発機構

¹ Graduate School of Science, University of Tokyo, ² Japan Agency for Marine-Earth Science and Technology

Subsurface temperature variability in the southeastern tropical Indian Ocean associated with the 2006 Indian Ocean Dipole (IOD) event and a possible mechanism responsible for cooling of the upper-ocean during a generation period of the IOD are investigated using satellite data, atmospheric reanalysis data, and results from a high-resolution ocean general circulation model (OFES). We conducted a heat budget analysis, focusing on the evolution for the 2006 IOD event, which was the largest positive IOD during the 2000s and the first event of the three consecutive positive IODs in 2006/07/08.

OFES reproduced the 2006 IOD event realistically in terms of time evolution of the subsurface temperature in the eastern tropical Indian Ocean. During May to July 2006, prior to the emergence of the surface IOD signals, several equatorial upwelling Kelvin waves are excited in the central Indian Ocean by zonal wind stress anomalies. These Kelvin waves penetrate into the coastal regions along the Sumatra and Java Islands, and generate subsurface negative temperature anomalies through a vertical advection term in the heat budget analysis. It turns out that the vertical advection term is dominated by a term associated with an advection of mean vertical temperature gradient by an anomalous vertical velocity. These subsurface cooling processes associated with the intraseasonal Kelvin waves seem to be important for the onset of the sea surface temperature anomaly off the coast of Sumatra and Java Islands in 2006.

Keywords: Indian Ocean Dipole, Upper ocean heat budget