

## 統合プログラム テーマ B 研究成果の発表状況 (2020)

### 概要

#### 件数一覧

論文発表 56 件(受理済み 47 件、投稿中 9 件) 学会発表 55 件 開発したモデル 1 件  
広報活動・記者発表 16 件 受賞等 1 件 著書等 2 件  
海外機関との連携 4 件 国内での連携 1 件 外国人招聘 0 件

### 2020 年度研究成果発表状況

#### ・論文(受理・印刷済み)

課題(i) サブ課題 a:ESM 開発・応用、

及び、課題(ii) サブ課題 b:地球システム-水資源・作物・土地利用モデル結合

1. Yokohata, T., Saito, K., Ito, A., Ohno, H., Tanaka, K., Hajima, T., & Iwahana, G. (2020). Future projection of greenhouse gas emissions due to permafrost degradation using a simple numerical scheme with a global land surface model. *Progress in Earth and Planetary Science*. <https://doi.org/10.1186/s40645-020-00366-8>
2. Yokohata, T., Saito, K., Takata, K., Nitta, T., Satoh, Y., Hajima, T., Sueyoshi, T., & Iwahana, G. (2020). Model improvement and future projection of permafrost processes in a global land surface model. *Progress in Earth and Planetary Science*. <https://doi.org/10.1186/s40645-020-00380-w>

課題(i) サブ課題 b:マルチモデル解析による温度上昇の確率論的評価、

及び、課題(ii) サブ課題 a:地球-社会経済システム相互作用

3. Nicholls, Z., Meinshausen, M., Lewis, J., Rojas Corradi, M., Dorheim, K., Gasser, T., Gieseke, R., Hope, A. P., Leach, N. J., McBride, L. A., Quilcaille, Y., Rogelj, J., Salawitch, R. J., Samset, B. H., Sandstad, M., Shiklomanov, A., Skeie, R. B., Smith, C. J., Smith, S. J., Su, X., Tsutsui, J., Vega-Westhoff, B., & Woodward, D. Reduced Complexity Model Intercomparison Project Phase 2 : Synthesising Earth system knowledge for probabilistic climate projections (in revision), *Earth's Future*. <https://doi.org/10.1002/essoar.10504793.1>.

課題(i) サブ課題 a:ESM 開発・応用

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- 課題(i) サブ課題 b: マルチモデル解析による温度上昇の確率論的評価
21. Daioglou, V., S. K. Rose, N. Bauer, A. Kitous, M. Muratori, F. Sano, S. Fujimori, M. J. Gidden, E. Kato, K. Keramidas, D. Klein, F. Leblanc, J. Tsutsui, M. Wise, and D. P. van

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課題(ii) サブ課題 a: 地球-社会経済システム相互作用

23. Tachiiri, K., X. Su, and K. Matsumoto (accepted), Identifying key processes and sectors in the interaction between climate and socioeconomic systems: a review toward integrating Earth–human systems, *Progress in Earth and Planetary Science*.
24. Keeley, A., Matsumoto, K., Tanaka, K. Sugiawan, Y., and Managi, S. (2020) The Impact of Renewable Energy Generation on the Spot Market Price in Germany: Ex-post Analysis Using Boosting Method. *The Energy Journal* 41(SI1), 119-139.
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課題(ii) サブ課題 b: 地球システム-水資源・作物・土地利用モデル結合

29. Yokohata, T., Kinoshita, T., Sakurai, G., Pokhrel, Y., Ito, A., Okada, M., Satoh, Y., Kato, E., Nitta, T., Fujimori, S., Felfelani, F., Masaki, Y., Iizumi, T., Nishimori, M., Hanasaki, N., Takahashi, K., Yamagata, Y., Emori, S. (2020) MIROC-INTEG-LAND version1: A global bio-geochemical land surface model with human water management, crop growth, and land-use change. *Geosci. Model Development*. 13, 4713-4747
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41. Ohgaito, R., A. Yamamoto, T. Hajima, R. O'ishi, M. Abe, H. Tatebe, A. Abe-Ouchi, and M. Kawamiya, Description of PMIP4 experiments using an earth system model MIROC-ES2L, GMD, in press
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47. Lambert F, N. Opazo, A. Ridgwell, G. Winckler, F. Lamy, G. Shaffer, K. Kohfeld, R. Ohgaito, S. Albani, and A. Abe-Ouchi (2021) Regional patterns and temporal evolution of ocean iron fertilization and CO<sub>2</sub> drawdown during the last glacial termination, *Earth and Planetary Science Letters*. 554, 116675

## ・論文(投稿中)

課題(i) サブ課題 a:ESM 開発・応用

1. Ohgaito R, Yamamoto A, Hajima T, O'ishi R, Abe M, Tatebe H, Abe-Ouchi A, and Kawamiya M (2021) PMIP4 experiments using MIROC-ES2L Earth System Model., *Geosci. Model Dev.* (accepted in condition).
2. Jones C.D., J. E. Hickman, S. T. Rumbold, J. Walton, R. D. Lamboll, R. B. Skeie, S. Fiedler, P. M. Forster, J. Rogelj, M. Abe, K. Calvin, C. Cassou, J. Cole, P. Davini, M. Deushi, M. Dix, J. Fyfe, N. Gillett, M. Kawamiya, M. Kelley, S. Kharin, T. Koshiro, C. Mackallah, P. Nabat, T. van Noije, P. Nolan, R. Ohgaito, D. Olivié, N. Oshima, J. Parodi, T. Reerink, L. Ren, A. Romanou, R. Seferian, Y. Tang, J. Tjiputra, E. Tourigny, K. Tsigaridis, H. Wang, M. Wu, K. Wyser, S. Yang, Y. Yang, and T. Ziehn (2021) The Climate Response to Emissions Reductions due to COVID-19, *GRL* in revision
3. Bock, J., M. Michou, P. Nabat, M. Abe, J. P. Mulcahy, D. J. L. Olivié, J. Schwinger, P. Suntharalingam, J. Tjiputra, M. van Hulten, M. Watanabe, A. Yool, and R. Séférian, Evaluation of ocean dimethylsulfide concentration and emission in CMIP6 models, submitted to *Biogeosciences*.
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5. Kobayashi, H., Oka, A., Yamamoto, A., and Abe-Ouchi, A.: Glacial carbon cycle changes by Southern Ocean processes with sedimentary amplification, submitted.

課題(i) サブ課題 b: マルチモデル解析による温度上昇の確率論的評価

6. Sakamoto, S., Y. Nagai, M. Sugiyama, S. Fujimori, E. Kato, R. Komiyama, Y. Matsuo, K. Oshiro, and D. S. Herran, Demand-side decarbonization and electrification: EMF 35 JMIP study, under review for Sustainability Science.
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課題(ii) サブ課題 a: 地球-社会経済システム相互作用

8. Chen, Y. and Matsumoto (revision) Industrial eco-efficiency and its determinants in China: A two-stage approach. Ecological Indicators.
9. Huang, Y. and Matsumoto, K. (submitted) Urbanization's impacts on changes in CO2 emissions in 30 provinces in China. Environmental Impact Assessment Review.

## ・著書等

課題(i) サブ課題 a: ESM 開発・応用

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及び、課題(ii) サブ課題 a: 地球-社会経済システム相互作用

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## ・広報活動、記者発表

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  - [1] 大気 CO2 濃度および海陸 CO2 フラックス
  - [2] 地球システム変数
  - [3] 1000 年規模気候-炭素循環シミュレーション
2. 羽島知洋、統合プロ ブローシャー テーマ B “サブ課題 ESM の開発・地球システ

ム解析”執筆

3. 大垣内るみ、令和2年度 統合的気候モデル高度化研究プログラム オンライン講演会 「地球温暖化を予測する」2020/10/16
4. 大垣内るみ、統合プログラム ブローシャ寄稿
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9. 取材対応: 『SDGs 2030 年までのゴール 改訂新版』株式会社みくに出版、2020 年 9 月
10. 一般向け講演: 地球のマングラ★ワンダー #1 [サル特集] 「シロテテナガザル漫談紀行 ~動物と人間の共生の森~」 「1.5 度の未来、2 度の未来~なぜ、いま私たちは気候変動について真剣に語り合うのか」 (オンライン) 2020 年 11 月
11. 一般向け講演: 気候変動枠組み条約 (UNFCCC) 科学上及び技術上の助言に関する補助機関会合、第 12 回リサーチダイアログ、ポスター発表、Interconnections of Earth-Human systems: Visualization and projection of future climate, ecosystem, water, energy and food (オンライン) 2020 年 11 月
12. 取材対応: NHK スペシャル取材、永久凍土シミュレーションデータ提供、2030 未来への分岐点、2020 年 11 月
13. 一般向け解説: 最近の研究成果「陸域統合モデル MIROC-INTEG-LAND: 気候・水資源・生態系・作物・土地利用結合モデルの開発」地球環境研究センターニュース 2021 年 1 月号
14. 一般向け解説: 最近の研究成果「地球温暖化で永久凍土融解はどこまで進むか」地球環境研究センターニュース 2021 年 2 月号
15. 一般向け解説: 計算で挑む環境研究—シミュレーションが広げる可能性「地球と人類の将来: 地球-人間システムモデルによる研究」地球環境研究センターニュース 3 月号
16. 一般向け講演: 福島エコテイル環境セミナー「そうだったのか! 地球温暖化のほんとうのこと?」 (オンライン) 2021 年 2 月

#### ・受賞等

1. 日本海洋学会 2020 年度環境科学賞、河宮 未知生、温暖化予測研究の推進および一般社会への普及啓発活動

## ・開発したモデル

1. MIROC-ES2L

## 国際共同研究の状況

### ・海外機関との連携

課題(i) サブ課題 a:ESM 開発・応用

1. 大垣内るみ、Covid-MIP : UKMO 他
2. 渡辺真吾、CMPI6 や GeoMIP 等の枠組みを通じて国際共同研究を実施中
3. Paleoclimate Modelling Intercomparison Project phase 4
4. Paleoclimate Modelling Intercomparison Project Past2Future working group

### ・国内での連携

課題(i) サブ課題 a:ESM 開発・応用

1. 渡辺真吾、国内のジオエンジニアリング研究に関心のある研究者間で情報交換を実施中。

### ・外国人招聘

なし