Supplement for 'Climate model code genealogy and its relation to climate feedbacks and sensitivity'

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Below is a list of references for model relationships, cited in the file models.csv in the code (Kuma, 2022b,a).

References

- Adachi, Y., Yukimoto, S., Deushi, M., Obata, A., Nakano, H., Tanaka, T. Y., Hosaka, M., Sakami, T., Yoshimura, H., Hirabara, M., Shindo, E., Tsujino, H., Mizuta, R., Yabu, S., Koshiro, T., Ose, T., and Kitoh, A.: Basic performance of a new earth system model of the Meteorological Research Institute (MRI-ESM1), Papers in Meteorology and Geophysics, 64, 1–19, https://doi.org/10.2467/mripapers.64.1, 2013.
- BCC: BCC_CSM 1.1, URL http://forecast.bcccsm.ncc-cma.net/web/channel-43.htm, last access: 17 August 2022, 2022.
- Bentsen, M., Bethke, I., Debernard, J. B., Iversen, T., Kirkevåg, A., Seland, Ø., Drange, H., Roelandt, C., Seierstad, I. A., Hoose, C., and Kristjánsson, J. E.: The Norwegian Earth System Model, NorESM1-M Part 1: Description and basic evaluation of the physical climate, Geoscientific Model Development, 6, 687–720, https://doi.org/10.5194/gmd-6-687-2013, 2013.
- Bethke, I., Wang, Y., Counillon, F., Keenlyside, N., Kimmritz, M., Fransner, F., Samuelsen, A., Langehaug, H., Svendsen, L., Chiu, P.-G., Passos, L., Bentsen, M., Guo, C., Gupta, A., Tjiputra, J., Kirkevåg, A., Olivié, D., Seland, Ø., Solsvik Vågane, J., Fan, Y., and Eldevik, T.: NorCPM1 and its contribution to CMIP6 DCPP, Geoscientific Model Development, 14, 7073–7116, https://doi.org/10.5194/gmd-14-7073-2021, 2021.
- Bi, D., Dix, M., Marsland, S., O'Farrell, S., Rashid, H., Uotila, P., Hirst, A., Kowalczyk, E., Golebiewski, M., Sullivan, A., Yan, H., Hannah, N., Franklin, C., Sun, Z., Vohralik, P., Watterson, I., Zhou, X., Fiedler, R., Collier, M., Ma, Y., Noonan, J., Stevens, L., Uhe, P., Zhu, H., Griffies, S., Hill, R., Harris, C., and Puri, K.: The ACCESS coupled model: description, control climate and evaluation, Australian Meteorological and Oceanographic Journal, 63, 41–64, https://doi.org/10.1071/ES13004, 2013.
- Bi, D., Dix, M., Marsland, S., O'Farrell, S., Sullivan, A., Bodman, R., Law, R., Harman, I., Srbinovsky, J., Rashid, H. A., Dobrohotoff, P., Mackallah, C., Yan, H., Hirst, A., Savita, A., Dias, F. B., Woodhouse, M., Fiedler, R., and Heerdegen, A.: Configuration and spin-up of ACCESS-CM2, the new generation Australian Community Climate and Earth System Simulator Coupled Model, Journal of Southern Hemisphere Earth Systems Science, 70, 225–251, https://doi.org/10.1071/ES19040, 2020.
- Cao, J., Ma, L., Liu, F., Chai, J., Zhao, H., He, Q., Wang, B., Bao, Y., Li, J., Yang, Y.-m., Deng, H., and Wang, B.: NUIST ESM v3 Data Submission to CMIP6, Advances in Atmospheric Sciences, 38, 268–284, https://doi.org/10.1007/s00376-020-0173-9, 2021.
- CCCma: Climate model: second generation Canadian earth system model, URL https://www.canada.ca/en/environment-climate-change/services/climate-change/science-research-data/modeling-projections-analysis/centre-modelling-analysis/models/second-generation-earth-system-model.html, last access: 17 August 2022, 2018.
- Chen, X., Guo, Z., Zhou, T., Li, J., Rong, X., Xin, Y., Chen, H., and Su, J.: Climate Sensitivity and Feedbacks of a New Coupled Model CAMS-CSM to Idealized CO2 Forcing: A Comparison with CMIP5 Models, Journal of Meteorological Research, 33, 31–45, https://doi.org/10.1007/s13351-019-8074-5, 2019.
- Cherchi, A., Fogli, P. G., Lovato, T., Peano, D., Iovino, D., Gualdi, S., Masina, S., Scoccimarro, E., Materia, S., Bellucci, A., and Navarra, A.: Global Mean Climate and Main Patterns of Variability in the CMCC-CM2 Coupled Model, Journal of Advances in Modeling Earth Systems, 11, 185–209, https://doi.org/10.1029/2018MS001369, 2019.

- CMCC: CMCC-CM, URL https://www.cmcc.it/models/cmcc-cm, last access: 17 August 2022, 2022.
- CMCC: CMCC-CESM-NEMO Climate coupled model, URL https://www.cmcc.it/models/cmcc-cesm-nemo-climate-coupled-model, last access: 17 August 2022, 2022a.
- CMCC: CMCC-ESM Earth System Model, URL https://www.cmcc.it/models/cmcc-esm-earth-system-model, last access: 17 August 2022, 2022b.
- CNRM: ARPEGE-Climate Version 5.1: Algorithmic Documentation, CNRM, URL https://www.umr-cnrm.fr/gmapdoc/IMG/pdf_arp51ca.pdf, last access: 17 August 2022, 2008.
- CNRM: ARPEGE-Climate, URL https://www.umr-cnrm.fr/spip.php?article124&lang=en, last access: 17 August 2022, 2022a.
- CNRM: CNRM-ESM2-1 model, URL https://www.umr-cnrm.fr/cmip6/spip.php?article10, last access: 17 August 2022, 2022b.
- Collins, W. D., Rasch, P. J., Boville, B. A., Hack, J. J., McCaa, J. R., Williamson, D. L., Briegleb, B. P., Bitz, C. M., Lin, S.-J., and Zhang, M.: The Formulation and Atmospheric Simulation of the Community Atmosphere Model Version 3 (CAM3), Journal of Climate, 19, 2144–2161, https://doi.org/10.1175/JCLI3760.1, 2006.
- Delworth, T. L., Broccoli, A. J., Rosati, A., Stouffer, R. J., Balaji, V., Beesley, J. A., Cooke, W. F., Dixon, K. W., Dunne, J., Dunne, K. A., Durachta, J. W., Findell, K. L., Ginoux, P., Gnanadesikan, A., Gordon, C. T., Griffies, S. M., Gudgel, R., Harrison, M. J., Held, I. M., Hemler, R. S., Horowitz, L. W., Klein, S. A., Knutson, T. R., Kushner, P. J., Langenhorst, A. R., Lee, H.-C., Lin, S.-J., Lu, J., Malyshev, S. L., Milly, P. C. D., Ramaswamy, V., Russell, J., Schwarzkopf, M. D., Shevliakova, E., Sirutis, J. J., Spelman, M. J., Stern, W. F., Winton, M., Wittenberg, A. T., Wyman, B., Zeng, F., and Zhang, R.: GFDL's CM2 Global Coupled Climate Models. Part I: Formulation and Simulation Characteristics, Journal of Climate, 19, 643–674, https://doi.org/10.1175/JCLI3629.1, 2006.
- Dunne, J. P., John, J. G., Adcroft, A. J., Griffies, S. M., Hallberg, R. W., Shevliakova, E., Stouffer, R. J., Cooke, W., Dunne, K. A., Harrison, M. J., Krasting, J. P., Malyshev, S. L., Milly, P. C. D., Phillipps, P. J., Sentman, L. T., Samuels, B. L., Spelman, M. J., Winton, M., Wittenberg, A. T., and Zadeh, N.: GFDL's ESM2 Global Coupled Climate–Carbon Earth System Models. Part I: Physical Formulation and Baseline Simulation Characteristics, Journal of Climate, 25, 6646–6665, https://doi.org/10.1175/JCLI-D-11-00560.1, 2012.
- Dunne, J. P., Horowitz, L. W., Adcroft, A. J., Ginoux, P., Held, I. M., John, J. G., Krasting, J. P., Malyshev, S., Naik, V., Paulot, F., Shevliakova, E., Stock, C. A., Zadeh, N., Balaji, V., Blanton, C., Dunne, K. A., Dupuis, C., Durachta, J., Dussin, R., Gauthier, P. P. G., Griffies, S. M., Guo, H., Hallberg, R. W., Harrison, M., He, J., Hurlin, W., McHugh, C., Menzel, R., Milly, P. C. D., Nikonov, S., Paynter, D. J., Ploshay, J., Radhakrishnan, A., Rand, K., Reichl, B. G., Robinson, T., Schwarzkopf, D. M., Sentman, L. T., Underwood, S., Vahlenkamp, H., Winton, M., Wittenberg, A. T., Wyman, B., Zeng, Y., and Zhao, M.: The GFDL Earth System Model Version 4.1 (GFDL-ESM 4.1): Overall Coupled Model Description and Simulation Characteristics, Journal of Advances in Modeling Earth Systems, 12, e2019MS002015, https://doi.org/10.1029/2019MS002015, e2019MS002015 2019MS002015, 2020.
- Edwards, P. N.: Chapter 2 A Brief History of Atmospheric General Circulation Modeling, in: General Circulation Model Development, edited by Randall, D. A., vol. 70 of *International Geophysics*, pp. 67–90, Academic Press, https://doi.org/10.1016/S0074-6142(00)80050-9, 2000.
- Edwards, P. N.: History of climate modeling, WIREs Climate Change, 2, 128-139, https://doi.org/10.1002/wcc.95, 2011.
- es-doc: CMIP5 Model: CMCC CMCC-CMS, URL https://view.es-doc.org/?renderMethod=name&type=cim.1. software.ModelComponent&name=CMCC-CMS&project=CMIP5, last access: 17 August 2022, 2015.
- FESOM: The AWI Earth System Model (AWI-ESM), URL https://fesom.de/models/awi-esm/, last access: 17 August 2022, 2022.
- Giorgetta, M. A., Brokopf, R., Crueger, T., Esch, M., Fiedler, S., Helmert, J., Hohenegger, C., Kornblueh, L., Köhler, M., Manzini, E., Mauritsen, T., Nam, C., Raddatz, T., Rast, S., Reinert, D., Sakradzija, M., Schmidt, H., Schneck, R., Schnur, R., Silvers, L., Wan, H., Zängl, G., and Stevens, B.: ICON-A, the Atmosphere Component of the ICON Earth System Model: I. Model Description, Journal of Advances in Modeling Earth Systems, 10, 1613–1637, https://doi.org/10.1029/2017MS001242, 2018.
- Golaz, J.-C., Caldwell, P. M., Van Roekel, L. P., Petersen, M. R., Tang, Q., Wolfe, J. D., Abeshu, G., Anantharaj, V., Asay-Davis, X. S., Bader, D. C., Baldwin, S. A., Bisht, G., Bogenschutz, P. A., Branstetter, M., Brunke, M. A., Brus, S. R., Burrows, S. M., Cameron-Smith, P. J., Donahue, A. S., Deakin, M., Easter, R. C., Evans, K. J., Feng, Y., Flanner, M., Foucar, J. G., Fyke, J. G., Griffin, B. M., Hannay, C., Harrop, B. E., Hoffman, M. J., Hunke, E. C., Jacob, R. L.,

- Jacobsen, D. W., Jeffery, N., Jones, P. W., Keen, N. D., Klein, S. A., Larson, V. E., Leung, L. R., Li, H.-Y., Lin, W., Lipscomb, W. H., Ma, P.-L., Mahajan, S., Maltrud, M. E., Mametjanov, A., McClean, J. L., McCoy, R. B., Neale, R. B., Price, S. F., Qian, Y., Rasch, P. J., Reeves Eyre, J. E. J., Riley, W. J., Ringler, T. D., Roberts, A. F., Roesler, E. L., Salinger, A. G., Shaheen, Z., Shi, X., Singh, B., Tang, J., Taylor, M. A., Thornton, P. E., Turner, A. K., Veneziani, M., Wan, H., Wang, H., Wang, S., Williams, D. N., Wolfram, P. J., Worley, P. H., Xie, S., Yang, Y., Yoon, J.-H., Zelinka, M. D., Zender, C. S., Zeng, X., Zhang, C., Zhang, K., Zhang, Y., Zheng, X., Zhou, T., and Zhu, Q.: The DOE E3SM Coupled Model Version 1: Overview and Evaluation at Standard Resolution, Journal of Advances in Modeling Earth Systems, 11, 2089–2129, https://doi.org/10.1029/2018MS001603, 2019.
- Guo, Y., Yu, Y., Lin, P., Liu, H., He, B., Bao, Q., Zhao, S., and Wang, X.: Overview of the CMIP6 Historical Experiment Datasets with the Climate System Model CAS FGOALS-f3-L, Advances in Atmospheric Sciences, 37, 1057–1066, https://doi.org/10.1007/s00376-020-2004-4, 2020.
- Hai-Yang, Y., Qing, B., Lin-Jiong, Z., Xiao-Cong, W., and Yi-Min, L.: Sensitivity of Precipitation in Aqua-Planet Experiments with an AGCM, Atmospheric and Oceanic Science Letters, 7, 1–6, https://doi.org/10.3878/j.issn.1674-2834.13. 0033, 2014.
- Hajima, T., Watanabe, M., Yamamoto, A., Tatebe, H., Noguchi, M. A., Abe, M., Ohgaito, R., Ito, A., Yamazaki, D., Okajima, H., Ito, A., Takata, K., Ogochi, K., Watanabe, S., and Kawamiya, M.: Development of the MIROC-ES2L Earth system model and the evaluation of biogeochemical processes and feedbacks, Geoscientific Model Development, 13, 2197–2244, https://doi.org/10.5194/gmd-13-2197-2020, 2020.
- Hazeleger, W., Severijns, C., Semmler, T., Ştefănescu, S., Yang, S., Wang, X., Wyser, K., Dutra, E., Baldasano, J. M., Bintanja, R., Bougeault, P., Caballero, R., Ekman, A. M. L., Christensen, J. H., van den Hurk, B., Jimenez, P., Jones, C., Kållberg, P., Koenigk, T., McGrath, R., Miranda, P., van Noije, T., Palmer, T., Parodi, J. A., Schmith, T., Selten, F., Storelvmo, T., Sterl, A., Tapamo, H., Vancoppenolle, M., Viterbo, P., and Willén, U.: EC-Earth: A Seamless Earth-System Prediction Approach in Action, Bulletin of the American Meteorological Society, 91, 1357–1364, https://doi.org/10.1175/2010BAMS2877.1, 2010.
- Hazeleger, W., Wang, X., Severijns, C., Ştefănescu, S., Bintanja, R., Sterl, A., Wyser, K., Semmler, T., Yang, S., van den Hurk, B., van Noije, T., van der Linden, E., and van der Wiel, K.: EC-Earth V2.2: description and validation of a new seamless earth system prediction model, Climate Dynamics, 39, 2611–2629, https://doi.org/10.1007/s00382-011-1228-5, 2012.
- He, B., Bao, Q., Wang, X., Zhou, L., Wu, X., Liu, Y., Wu, G., Chen, K., He, S., Hu, W., Li, J., Li, J., Nian, G., Wang, L., Yang, J., Zhang, M., and Zhang, X.: CAS FGOALS-f3-L Model Datasets for CMIP6 Historical Atmospheric Model Intercomparison Project Simulation, Advances in Atmospheric Sciences, 36, 771–778, https://doi.org/10.1007/s00376-019-9027-8, 2019.
- IPSL CMC: IPSL-CM4, URL https://cmc.ipsl.fr/ipsl-climate-models/ipsl-cm4/, last access: 17 August 2022, 2022.
- Ji, D., Wang, L., Feng, J., Wu, Q., Cheng, H., Zhang, Q., Yang, J., Dong, W., Dai, Y., Gong, D., Zhang, R.-H., Wang, X., Liu, J., Moore, J. C., Chen, D., and Zhou, M.: Description and basic evaluation of Beijing Normal University Earth System Model (BNU-ESM) version 1, Geoscientific Model Development, 7, 2039–2064, https://doi.org/10.5194/gmd-7-2039-2014, 2014.
- Johns, T. C., Durman, C. F., Banks, H. T., Roberts, M. J., McLaren, A. J., Ridley, J. K., Senior, C. A., Williams, K. D., Jones, A., Rickard, G. J., Cusack, S., Ingram, W. J., Crucifix, M., Sexton, D. M. H., Joshi, M. M., Dong, B.-W., Spencer, H., Hill, R. S. R., Gregory, J. M., Keen, A. B., Pardaens, A. K., Lowe, J. A., Bodas-Salcedo, A., Stark, S., and Searl, Y.: The New Hadley Centre Climate Model (HadGEM1): Evaluation of Coupled Simulations, Journal of Climate, 19, 1327–1353, https://doi.org/10.1175/JCLI3712.1, 2006.
- Jungclaus, J. H., Lorenz, S. J., Schmidt, H., Brovkin, V., Brüggemann, N., Chegini, F., Crüger, T., De-Vrese, P., Gayler, V., Giorgetta, M. A., Gutjahr, O., Haak, H., Hagemann, S., Hanke, M., Ilyina, T., Korn, P., Kröger, J., Linardakis, L., Mehlmann, C., Mikolajewicz, U., Müller, W. A., Nabel, J. E. M. S., Notz, D., Pohlmann, H., Putrasahan, D. A., Raddatz, T., Ramme, L., Redler, R., Reick, C. H., Riddick, T., Sam, T., Schneck, R., Schnur, R., Schupfner, M., von Storch, J.-S., Wachsmann, F., Wieners, K.-H., Ziemen, F., Stevens, B., Marotzke, J., and Claussen, M.: The ICON Earth System Model Version 1.0, Journal of Advances in Modeling Earth Systems, 14, e2021MS002813, https://doi.org/10.1029/2021MS002813, e2021MS002813 2021MS002813, 2022.
- Krishnan, R., Swapna, P., Choudhury, A. D., Narayansetti, S., Prajeesh, A. G., Singh, M., Modi, A., Mathew, R., Vellore, R., Jyoti, J., Sabin, T. P., Sanjay, J., and Ingle, S.: The IITM Earth System Model (IITM ESM), https://doi.org/10.48550/ARXIV.2101.03410, 2021.
- Kuma, P.: Code accompanying the manuscript "Climate model code genealogy and its relation to climate feedbacks and sensitivity", https://doi.org/10.5281/zenodo.7407118, 2022a.

- Kuma, P.: Code accompanying the manuscript "Climate model code genealogy and its relation to climate feedbacks and sensitivity", URL https://github.com/peterkuma/model-code-genealogy-2022/, last access: 6 December 2022, 2022b.
- Legutke, S. and Voss, R.: The Hamburg atmosphere-ocean coupled circulation model ECHO-G, Tech. Rep. 18, Deutsches Klimarechenzentrum, Bundesstraße 55, D-20146 Hamburg, Germany, URL https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.395.605&rep=rep1&type=pdf, 1999.
- Li, F., Waugh, D. W., Douglass, A. R., Newman, P. A., Pawson, S., Stolarski, R. S., Strahan, S. E., and Nielsen, J. E.: Seasonal variations of stratospheric age spectra in the Goddard Earth Observing System Chemistry Climate Model (GEOSCCM), Journal of Geophysical Research: Atmospheres, 117, https://doi.org/10.1029/2011JD016877, 2012.
- Li, L., Yu, Y., Tang, Y., Lin, P., Xie, J., Song, M., Dong, L., Zhou, T., Liu, L., Wang, L., Pu, Y., Chen, X., Chen, L., Xie, Z., Liu, H., Zhang, L., Huang, X., Feng, T., Zheng, W., Xia, K., Liu, H., Liu, J., Wang, Y., Wang, L., Jia, B., Xie, F., Wang, B., Zhao, S., Yu, Z., Zhao, B., and Wei, J.: The Flexible Global Ocean-Atmosphere-Land System Model Grid-Point Version 3 (FGOALS-g3): Description and Evaluation, Journal of Advances in Modeling Earth Systems, 12, e2019MS002012, https://doi.org/10.1029/2019MS002012, e2019MS002012 2019MS002012, 2020.
- Lin, Y., Huang, X., Liang, Y., Qin, Y., Xu, S., Huang, W., Xu, F., Liu, L., Wang, Y., Peng, Y., Wang, L., Xue, W., Fu, H., Zhang, G. J., Wang, B., Li, R., Zhang, C., Lu, H., Yang, K., Luo, Y., Bai, Y., Song, Z., Wang, M., Zhao, W., Zhang, F., Xu, J., Zhao, X., Lu, C., Chen, Y., Luo, Y., Hu, Y., Tang, Q., Chen, D., Yang, G., and Gong, P.: Community Integrated Earth System Model (CIESM): Description and Evaluation, Journal of Advances in Modeling Earth Systems, 12, e2019MS002 036, https://doi.org/10.1029/2019MS002036, e2019MS002036 2019MS002036, 2020.
- Martin, G. M., Ringer, M. A., Pope, V. D., Jones, A., Dearden, C., and Hinton, T. J.: The Physical Properties of the Atmosphere in the New Hadley Centre Global Environmental Model (HadGEM1). Part I: Model Description and Global Climatology, Journal of Climate, 19, 1274–1301, https://doi.org/10.1175/JCLI3636.1, 2006.
- Mauritsen, T., Bader, J., Becker, T., Behrens, J., Bittner, M., Brokopf, R., Brovkin, V., Claussen, M., Crueger, T., Esch, M., Fast, I., Fiedler, S., Fläschner, D., Gayler, V., Giorgetta, M., Goll, D. S., Haak, H., Hagemann, S., Hedemann, C., Hohenegger, C., Ilyina, T., Jahns, T., Jimenéz-de-la Cuesta, D., Jungclaus, J., Kleinen, T., Kloster, S., Kracher, D., Kinne, S., Kleberg, D., Lasslop, G., Kornblueh, L., Marotzke, J., Matei, D., Meraner, K., Mikolajewicz, U., Modali, K., Möbis, B., Müller, W. A., Nabel, J. E. M. S., Nam, C. C. W., Notz, D., Nyawira, S.-S., Paulsen, H., Peters, K., Pincus, R., Pohlmann, H., Pongratz, J., Popp, M., Raddatz, T. J., Rast, S., Redler, R., Reick, C. H., Rohrschneider, T., Schemann, V., Schmidt, H., Schnur, R., Schulzweida, U., Six, K. D., Stein, L., Stemmler, I., Stevens, B., von Storch, J.-S., Tian, F., Voigt, A., Vrese, P., Wieners, K.-H., Wilkenskjeld, S., Winkler, A., and Roeckner, E.: Developments in the MPI-M Earth System Model version 1.2 (MPI-ESM1.2) and Its Response to Increasing CO2, Journal of Advances in Modeling Earth Systems, 11, 998–1038, https://doi.org/10.1029/2018MS001400, 2019.
- Meehl, G. A., Washington, W. M., Arblaster, J. M., Hu, A., Teng, H., Kay, J. E., Gettelman, A., Lawrence, D. M., Sanderson, B. M., and Strand, W. G.: Climate Change Projections in CESM1(CAM5) Compared to CCSM4, Journal of Climate, 26, 6287–6308, https://doi.org/10.1175/JCLI-D-12-00572.1, 2013.
- Merryfield, W. J., Lee, W.-S., Boer, G. J., Kharin, V. V., Scinocca, J. F., Flato, G. M., Ajayamohan, R. S., Fyfe, J. C., Tang, Y., and Polavarapu, S.: The Canadian Seasonal to Interannual Prediction System. Part I: Models and Initialization, Monthly Weather Review, 141, 2910–2945, https://doi.org/10.1175/MWR-D-12-00216.1, 2013.
- MPI: MPI-ESM, URL https://mpimet.mpg.de/en/science/models/mpi-esm/, last access: 17 August 2022, 2022.
- NCAR: CESM Configuration Naming Conventions, URL https://www.cesm.ucar.edu/models/cesm1.0/config_conventions_cesm.html, last access: 17 August 2022, 2022.
- Ohgaito, R., Sueyoshi, T., Abe-Ouchi, A., Hajima, T., Watanabe, S., Kim, H.-J., Yamamoto, A., and Kawamiya, M.: Can an Earth System Model simulate better climate change at mid-Holocene than an AOGCM? A comparison study of MIROC-ESM and MIROC3, Climate of the Past, 9, 1519–1542, https://doi.org/10.5194/cp-9-1519-2013, 2013.
- Pak, G., Noh, Y., Lee, M.-I., Yeh, S.-W., Kim, D., Kim, S.-Y., Lee, J.-L., Lee, H. J., Hyun, S.-H., Lee, K.-Y., Lee, J.-H., Park, Y.-G., Jin, H., Park, H., and Kim, Y. H.: Korea Institute of Ocean Science and Technology Earth System Model and Its Simulation Characteristics, Ocean Science Journal, 56, 18–45, https://doi.org/10.1007/s12601-021-00001-7, 2021.
- Park, S., Shin, J., Kim, S., Oh, E., and Kim, Y.: Global Climate Simulated by the Seoul National University Atmosphere Model Version 0 with a Unified Convection Scheme (SAM0-UNICON), Journal of Climate, 32, 2917–2949, https://doi.org/10.1175/JCLI-D-18-0796.1, 2019.
- PCMDI: BCCR-BCM2.0: Model Information of Potential Use to the IPCC Lead Authors and the AR4, URL https://pcmdi.llnl.gov/ipcc/model_documentation/BCCR_BCM2.0.pdf, 2005.

- Phipps, S. J., Rotstayn, L. D., Gordon, H. B., Roberts, J. L., Hirst, A. C., and Budd, W. F.: The CSIRO Mk3L climate system model version 1.0 Part 1: Description and evaluation, Geoscientific Model Development, 4, 483–509, https://doi.org/10.5194/gmd-4-483-2011, 2011.
- Roeckner, E., Arpe, K., Bengtsson, L., Brinkop, S., Dümenil, L., Esch, M., Kirk, E., Lunkeit, F., Ponater, M., Rockel, B., et al.: Simulation of the present-day climate with the ECHAM model: Impact of model physics and resolution, Tech. Rep. 93, Max-Planck-Institut für Meteorologie, URL https://pure.mpg.de/pubman/faces/ViewItemOverviewPage.jsp?itemId=item_1852612, 1992.
- Roehrig, R., Beau, I., Saint-Martin, D., Alias, A., Decharme, B., Guérémy, J.-F., Voldoire, A., Abdel-Lathif, A. Y., Bazile, E., Belamari, S., Blein, S., Bouniol, D., Bouteloup, Y., Cattiaux, J., Chauvin, F., Chevallier, M., Colin, J., Douville, H., Marquet, P., Michou, M., Nabat, P., Oudar, T., Peyrillé, P., Piriou, J.-M., Salas y Mélia, D., Séférian, R., and Sénési, S.: The CNRM Global Atmosphere Model ARPEGE-Climat 6.3: Description and Evaluation, Journal of Advances in Modeling Earth Systems, 12, e2020MS002075, https://doi.org/10.1029/2020MS002075, e2020MS002075, 2020.
- Russell, G. L., Miller, J. R., and Rind, D.: A coupled atmosphere-ocean model for transient climate change studies, Atmosphere-Ocean, 33, 683–730, https://doi.org/10.1080/07055900.1995.9649550, 1995.
- Saha, S., Nadiga, S., Thiaw, C., Wang, J., Wang, W., Zhang, Q., den Dool, H. M. V., Pan, H.-L., Moorthi, S., Behringer, D., Stokes, D., Peña, M., Lord, S., White, G., Ebisuzaki, W., Peng, P., and Xie, P.: The NCEP Climate Forecast System, Journal of Climate, 19, 3483–3517, https://doi.org/10.1175/JCLI3812.1, 2006.
- Salas-Mélia, D., Chauvin, F., Déqué, M., Douville, H., Gueremy, J., Marquet, P., Planton, S., Royer, J., and Tyteca, S.: Description and validation of the CNRM-CM3 global coupled model, URL http://www.cnrm.meteo.fr/scenario2004/paper_cm3.pdf, 2005.
- Salimun, E., Tangang, F., Juneng, L., Zwiers, F. W., and Merryfield, W. J.: Skill evaluation of the CanCM4 and its MOS for seasonal rainfall forecast in Malaysia during the early and late winter monsoon periods, International Journal of Climatology, 36, 439–454, https://doi.org/10.1002/joc.4361, 2016.
- Schmidt, G. A., Ruedy, R., Hansen, J. E., Aleinov, I., Bell, N., Bauer, M., Bauer, S., Cairns, B., Canuto, V., Cheng, Y., Genio, A. D., Faluvegi, G., Friend, A. D., Hall, T. M., Hu, Y., Kelley, M., Kiang, N. Y., Koch, D., Lacis, A. A., Lerner, J., Lo, K. K., Miller, R. L., Nazarenko, L., Oinas, V., Perlwitz, J., Perlwitz, J., Rind, D., Romanou, A., Russell, G. L., Sato, M., Shindell, D. T., Stone, P. H., Sun, S., Tausnev, N., Thresher, D., and Yao, M.-S.: Present-Day Atmospheric Simulations Using GISS ModelE: Comparison to In Situ, Satellite, and Reanalysis Data, Journal of Climate, 19, 153–192, https://doi.org/10.1175/JCLI3612.1, 2006.
- Schmidt, G. A., Kelley, M., Nazarenko, L., Ruedy, R., Russell, G. L., Aleinov, I., Bauer, M., Bauer, S. E., Bhat, M. K., Bleck, R., Canuto, V., Chen, Y.-H., Cheng, Y., Clune, T. L., Del Genio, A., de Fainchtein, R., Faluvegi, G., Hansen, J. E., Healy, R. J., Kiang, N. Y., Koch, D., Lacis, A. A., LeGrande, A. N., Lerner, J., Lo, K. K., Matthews, E. E., Menon, S., Miller, R. L., Oinas, V., Oloso, A. O., Perlwitz, J. P., Puma, M. J., Putman, W. M., Rind, D., Romanou, A., Sato, M., Shindell, D. T., Sun, S., Syed, R. A., Tausnev, N., Tsigaridis, K., Unger, N., Voulgarakis, A., Yao, M.-S., and Zhang, J.: Configuration and assessment of the GISS ModelE2 contributions to the CMIP5 archive, Journal of Advances in Modeling Earth Systems, 6, 141–184, https://doi.org/10.1002/2013MS000265, 2014.
- Seland, Ø., Bentsen, M., Olivié, D., Toniazzo, T., Gjermundsen, A., Graff, L. S., Debernard, J. B., Gupta, A. K., He, Y.-C., Kirkevåg, A., Schwinger, J., Tjiputra, J., Aas, K. S., Bethke, I., Fan, Y., Griesfeller, J., Grini, A., Guo, C., Ilicak, M., Karset, I. H. H., Landgren, O., Liakka, J., Moseid, K. O., Nummelin, A., Spensberger, C., Tang, H., Zhang, Z., Heinze, C., Iversen, T., and Schulz, M.: Overview of the Norwegian Earth System Model (NorESM2) and key climate response of CMIP6 DECK, historical, and scenario simulations, Geoscientific Model Development, 13, 6165–6200, https://doi.org/10.5194/gmd-13-6165-2020, 2020.
- Sellar, A. A., Jones, C. G., Mulcahy, J. P., Tang, Y., Yool, A., Wiltshire, A., O'Connor, F. M., Stringer, M., Hill, R., Palmieri, J., Woodward, S., de Mora, L., Kuhlbrodt, T., Rumbold, S. T., Kelley, D. I., Ellis, R., Johnson, C. E., Walton, J., Abraham, N. L., Andrews, M. B., Andrews, T., Archibald, A. T., Berthou, S., Burke, E., Blockley, E., Carslaw, K., Dalvi, M., Edwards, J., Folberth, G. A., Gedney, N., Griffiths, P. T., Harper, A. B., Hendry, M. A., Hewitt, A. J., Johnson, B., Jones, A., Jones, C. D., Keeble, J., Liddicoat, S., Morgenstern, O., Parker, R. J., Predoi, V., Robertson, E., Siahaan, A., Smith, R. S., Swaminathan, R., Woodhouse, M. T., Zeng, G., and Zerroukat, M.: UKESM1: Description and Evaluation of the U.K. Earth System Model, Journal of Advances in Modeling Earth Systems, 11, 4513–4558, https://doi.org/10.1029/2019MS001739, 2019.
- Semmler, T., Danilov, S., Gierz, P., Goessling, H. F., Hegewald, J., Hinrichs, C., Koldunov, N., Khosravi, N., Mu, L., Rackow, T., Sein, D. V., Sidorenko, D., Wang, Q., and Jung, T.: Simulations for CMIP6 With the AWI Climate Model AWI-CM-1-1, Journal of Advances in Modeling Earth Systems, 12, e2019MS002009, https://doi.org/10.1029/2019MS002009, e2019MS002009 2019MS002009, 2020.

- Sepulchre, P., Caubel, A., Ladant, J.-B., Bopp, L., Boucher, O., Braconnot, P., Brockmann, P., Cozic, A., Donnadieu, Y., Dufresne, J.-L., Estella-Perez, V., Ethé, C., Fluteau, F., Foujols, M.-A., Gastineau, G., Ghattas, J., Hauglustaine, D., Hourdin, F., Kageyama, M., Khodri, M., Marti, O., Meurdesoif, Y., Mignot, J., Sarr, A.-C., Servonnat, J., Swingedouw, D., Szopa, S., and Tardif, D.: IPSL-CM5A2 an Earth system model designed for multi-millennial climate simulations, Geoscientific Model Development, 13, 3011–3053, https://doi.org/10.5194/gmd-13-3011-2020, 2020.
- Somerville, R., Stone, P., Halem, M., Hansen, J., Hogan, J., Druyan, L., Russell, G., Lacis, A., Quirk, W., and Tenenbaum, J.: The GISS Model of the Global Atmosphere, Journal of Atmospheric Sciences, 31, 84–117, https://doi.org/10.1175/1520-0469(1974)031/0084:TGMOTG/2.0.CO;2, 1974.
- Stevens, B., Giorgetta, M., Esch, M., Mauritsen, T., Crueger, T., Rast, S., Salzmann, M., Schmidt, H., Bader, J., Block, K., Brokopf, R., Fast, I., Kinne, S., Kornblueh, L., Lohmann, U., Pincus, R., Reichler, T., and Roeckner, E.: Atmospheric component of the MPI-M Earth System Model: ECHAM6, Journal of Advances in Modeling Earth Systems, 5, 146–172, https://doi.org/10.1002/jame.20015, 2013.
- Swart, N. C., Cole, J. N. S., Kharin, V. V., Lazare, M., Scinocca, J. F., Gillett, N. P., Anstey, J., Arora, V., Christian, J. R., Hanna, S., Jiao, Y., Lee, W. G., Majaess, F., Saenko, O. A., Seiler, C., Seinen, C., Shao, A., Sigmond, M., Solheim, L., von Salzen, K., Yang, D., and Winter, B.: The Canadian Earth System Model version 5 (CanESM5.0.3), Geoscientific Model Development, 12, 4823–4873, https://doi.org/10.5194/gmd-12-4823-2019, 2019.
- Tokioka, T.: A description of the MRI atmospheric general circulation model (the MRI-GCM-I), Tech. Rep. 13, Forecast Research Division, Meteorological Research Institute, Japan, URL https://cir.nii.ac.jp/crid/1571698599052170880, 1984.
- Wang, Y.-C., Hsu, H.-H., Chen, C.-A., Tseng, W.-L., Hsu, P.-C., Lin, C.-W., Chen, Y.-L., Jiang, L.-C., Lee, Y.-C., Liang, H.-C., Chang, W.-M., Lee, W.-L., and Shiu, C.-J.: Performance of the Taiwan Earth System Model in Simulating Climate Variability Compared With Observations and CMIP6 Model Simulations, Journal of Advances in Modeling Earth Systems, 13, e2020MS002353, https://doi.org/10.1029/2020MS002353, e2020MS002353 2020MS002353, 2021.
- Washington, W. M., Weatherly, J. W., Meehl, G. A., Semtner Jr., A. J., Bettge, T. W., Craig, A. P., Strand Jr., W. G., Arblaster, J., Wayland, V. B., James, R., and Zhang, Y.: Parallel climate model (PCM) control and transient simulations, Climate Dynamics, 16, 755–774, https://doi.org/10.1007/s003820000079, 2000.
- WCRP: WCRP-CMIP CMIP6_CVs version: 6.2.58.32, URL https://wcrp-cmip.github.io/CMIP6_CVs/docs/CMIP6_source_id.html, last access: 17 August 2022, 2022.
- Wu, T., Lu, Y., Fang, Y., Xin, X., Li, L., Li, W., Jie, W., Zhang, J., Liu, Y., Zhang, L., Zhang, F., Zhang, Y., Wu, F., Li, J., Chu, M., Wang, Z., Shi, X., Liu, X., Wei, M., Huang, A., Zhang, Y., and Liu, X.: The Beijing Climate Center Climate System Model (BCC-CSM): the main progress from CMIP5 to CMIP6, Geoscientific Model Development, 12, 1573–1600, https://doi.org/10.5194/gmd-12-1573-2019, 2019.
- Wu, T., Zhang, F., Zhang, J., Jie, W., Zhang, Y., Wu, F., Li, L., Yan, J., Liu, X., Lu, X., Tan, H., Zhang, L., Wang, J., and Hu, A.: Beijing Climate Center Earth System Model version 1 (BCC-ESM1): model description and evaluation of aerosol simulations, Geoscientific Model Development, 13, 977–1005, https://doi.org/10.5194/gmd-13-977-2020, 2020.
- Yu, Y., Zheng, W., Wang, B., Liu, H., and Liu, J.: Versions g1.0 and g1.1 of the LASG/IAP Flexible Global Ocean-Atmosphere-Land System model, Advances in Atmospheric Sciences, 28, 99–117, https://doi.org/10.1007/s00376-010-9112-5, 2011.
- Yukimoto, S., Adachi, Y., Hosaka, M., Sakami, T., Yoshimura, H., Hirabara, M., Tanaka, T. Y., Shindo, E., Tsujino, H., Deushi, M., Mizuta, R., Yabu, S., Obata, A., Nakano, H., Koshiro, T., Ose, T., and Kitoh, A.: A New Global Climate Model of the Meteorological Research Institute: MRI-CGCM3—Model Description and Basic Performance—, Journal of the Meteorological Society of Japan. Ser. II, 90A, 23–64, https://doi.org/10.2151/jmsj.2012-A02, 2012.
- Yukimoto, S., Kawai, H., Koshiro, T., Oshima, N., Yoshida, K., Urakawa, S., Tsujino, H., Deushi, M., Tanaka, T., Hosaka, M., Yabu, S., Yoshimura, H., Shindo, E., Mizuta, R., Obata, A., Adachi, Y., and Ishii, M.: The Meteorological Research Institute Earth System Model Version 2.0, MRI-ESM2.0: Description and Basic Evaluation of the Physical Component, Journal of the Meteorological Society of Japan. Ser. II, 97, 931–965, https://doi.org/10.2151/jmsj.2019-051, 2019.
- Zhang, H., Zhang, M., Jin, J., Fei, K., Ji, D., Wu, C., Zhu, J., He, J., Chai, Z., Xie, J., Dong, X., Zhang, D., Bi, X., Cao, H., Chen, H., Chen, K., Chen, X., Gao, X., Hao, H., Jiang, J., Kong, X., Li, S., Li, Y., Lin, P., Lin, Z., Liu, H., Liu, X., Shi, Y., Song, M., Wang, H., Wang, T., Wang, X., Wang, Z., Wei, Y., Wu, B., Xie, Z., Xu, Y., Yu, Y., Yuan, L., Zeng, Q., Zeng, X., Zhao, S., Zhou, G., and Zhu, J.: Description and Climate Simulation Performance of CAS-ESM Version 2, Journal of Advances in Modeling Earth Systems, 12, e2020MS002210, https://doi.org/10.1029/2020MS002210, e2020MS002210, 2020.

- Zhao, M., Held, I. M., Lin, S.-J., and Vecchi, G. A.: Simulations of Global Hurricane Climatology, Interannual Variability, and Response to Global Warming Using a 50-km Resolution GCM, Journal of Climate, 22, 6653–6678, https://doi.org/10.1175/2009JCLI3049.1, 2009.
- Zhou, T., Wu, B., Wen, X., Li, L., and Wang, B.: A fast version of LASG/IAP climate system model and its 1000-year control integration, Advances in Atmospheric Sciences, 25, 655–672, https://doi.org/10.1007/s00376-008-0655-7, 2008.
- Zhou, T., Wang, B., Yu, Y., Liu, Y., Zheng, W., Li, L., Wu, B., Lin, P., Guo, Z., Man, W., Bao, Q., Duan, A., Liu, H., Chen, X., He, B., Li, J., Zou, L., Wang, X., Zhang, L., Sun, Y., and Zhang, W.: The FGOALS climate system model as a modeling tool for supporting climate sciences: An overview, Earth and Planetary Physics, 2, 276–291, https://doi.org/10.26464/epp2018026, 2018.
- Ziehn, T., Chamberlain, M. A., Law, R. M., Lenton, A., Bodman, R. W., Dix, M., Stevens, L., Wang, Y.-P., and Srbinovsky, J.: The Australian Earth System Model: ACCESS-ESM1.5, Journal of Southern Hemisphere Earth Systems Science, 70, 193–214, https://doi.org/10.1071/ES19035, 2020.