



## Questions & Answers Part 1

Please type your questions in the Question Box. We will try our best to get to all your questions. If we don't, feel free to email Amita Mehta ([amita.v.mehta@nasa.gov](mailto:amita.v.mehta@nasa.gov)) or Sean McCartney ([sean.mccartney@nasa.gov](mailto:sean.mccartney@nasa.gov)).

**Question 1: Are all data available on Google Earth Engine (GEE) so we can do analysis for other regions such as another US state?**

Answer 1: Yes, we will go over that option.

**Question 2: Why is statistical downscaling not usually used compared to dynamical downscaling?**

Answer 2: There are several statistically downscaled products on a global scale, such as GDDP, but no dynamically downscaled global products, as they are computationally expensive to run.

**Question 3: Why are these SSP measures based on radioactive emissions?**

Answer 3: They are not based on radioactive emissions - they are based on greenhouse gas emissions and radiative forcing resulting from them.

**Question 4: What bibliographical references are recommended to understand the downscaling processing?**

Answer 4: Specifically for the BCSD method:

NEX-GDDP-CMIP6 homepage:

<https://www.nccs.nasa.gov/services/data-collections/land-based-products/nex-gddp-cmip6>

Thrasher, B., Wang, W., Michaelis, A. et al. NASA Global Daily Downscaled Projections, CMIP6. Sci Data 9, 262 (2022). <https://doi.org/10.1038/s41597-022-01393-4>

**Question 5: Has the 2015 - 2025 future model output been evaluated against observed conditions? Has there been any sort of comparison study between the projections of 2015-2025 NEX-GDDP and measured values?**

Answer 5: There have been many studies conducted:

[https://scholar.google.com/scholar?hl=en&as\\_sdt=0%2C5&q=nex-gddp-cmip6&btnG=](https://scholar.google.com/scholar?hl=en&as_sdt=0%2C5&q=nex-gddp-cmip6&btnG=)



**Question 6: Does GDDP share codes with other GCMs? Or is it independent?**

Answer 6: It is independent being that it is a statistical method for downscaling the results of GCMs.

**Question 7: Beyond the 9 variables, is it possible to get wind direction from NEX-GDDP?**

Answer 7: It is not a variable that is processed and it is not provided.

**Question 8: Would we need to use the entire 30TB of data?**

Answer 8: No!

**Question 9: Is 'tas' (near-surface air temperature) defined as the average of daily maximum and minimum temperatures (tasmax and tasmin), or is it calculated as the mean of hourly temperature values?**

Answer 9: For those models that provided tasmax & tasmin, tas is the average of those. For the few models that only provided tas, it was downscaled independently.

**Question 10: Do you think bias adjustment is important for GDDP data for use?**

Answer 10: Yes, bias correction is important, and it is more of an adjustment than a correction. Most statistical methods provide a bias adjustment of some kind.

**Question 11: Which reference datasets are used to downscale by statistical methods?**

Answer 11: For GDDP, it was the GMDF global dataset, and the link was provided in the presentation slides.

**Question 12: Do GDDP future projections have system biases compared to historical observations (i.e., when plotting both historical and future weather data, will it show a sharp change when switching to future data?), or have those biases been fixed?**

Answer 12: The entire archive has gone through bias correction. The SSP experiments follow directly from the output of the historical experiment, so any discontinuity would be a result of an error.



**Question 13: While selecting an appropriate sampling window can improve bias correction for temperature variables, how effective is this approach for precipitation, given its higher temporal variability and intermittency?**

Answer 13: Because the window is large (31 days), the bias correction should grab enough data points to bias correct and not go outside the boundary of what is possible.

**Question 14: Will the steps described here be required for anyone creating a downscaled model? What downscaled models are already available?**

Answer 14: Most downscaling methods make their code available or at least have an associated paper describing the method in detail such that it can be recreated.

**Question 15: If I want to do a GDDP data analysis, do I have to include all GCMs? If not, how can I select models? Are there any rules or criteria?**

Answer 15: No rules or criteria. It is also dependent on application and risk tolerance for your application. Refer to previous Q's.

**Question 16: Is there any package or function which one can directly implement for Bias Correction and Spatial Disaggregation for his/her own set of observations?**

Answer 16: The scripts provided in the presentation are relatively straight forward but contact us for any additional questions.

**Question 17: What kind of temperature? Land surface? Air? "Real feel"?**

Answer 17: NEX-GDDP includes 2-meter air temperatures as defined by the CMIP.

**Question 18: The curves are presented in case of 1D data. How can we obtain the same in case of RGB or colored data images as displayed in both images (before and after scaling)?**

Answer 18: You can find the outputs of the original CMIP6 data online.

**Question 19: What is the error associated? My interest is to execute especially over Africa.**

Answer 19: Comparison of models over your region of interest may help with your application. Look into studies and research related to Africa.



**Question 20: Where would I find the shape files for the country, region or state that I would like to work on?**

Answer 20: Please refer to:

<https://www.fao.org/agroinformatics/training-and-resources/data-sets/data-set-detail/global-gaul-new-2024-release/en#:~:text=Data%20can%20be%20downloaded%20at,%2D4177%2D9d4a%2Dbb2472d0367e>.

**Question 21: Can you explain a bit more about what the SSP scenario is?**

Answer 21: Please see:

[https://appliedsciences.nasa.gov/sites/default/files/2024-07/Drought\\_Part3\\_FINAL.pdf](https://appliedsciences.nasa.gov/sites/default/files/2024-07/Drought_Part3_FINAL.pdf).  
Also, [https://unfccc.int/sites/default/files/part1\\_iiasa\\_rogelj\\_ssp\\_poster.pdf](https://unfccc.int/sites/default/files/part1_iiasa_rogelj_ssp_poster.pdf).

**Question 22: Will downscaling be done for bioclimatic variables too?**

Answer 22: No, but you can use downscaled output to create those.

**Question 23: I'm having problems linking to API when I get to the end of registering Google Cloud. I don't have admin rights for my computer, my company does. Is this something I will need to have my IT connect for me?**

Answer 23: Perhaps your IT contact will have to do that.

**Question 24: How is quantile mapping conducted for the period 2026–2100 in the absence of observed data? For the period 2015–2025, which SSP scenario provides results most consistent with observations?**

Answer 24: The QM uses the same pool no matter the year. For the SSP temperature variables, the 2015-2100 trend was first removed before bias correction and then returned afterwards.

**Question 25: How do we determine which model is appropriate for a given location or scenario? Could you please explain this in more detail?**

Answer 25: You will have to check individual model outputs (temperatures and precipitation) and compare with in situ data in your region and decide which model is appropriate. Also, using ensemble mean data may have less. Also check scientific literature for model comparisons over your region.

**Question 26: Could you elaborate more on bias correction of precipitation, particularly the greater number of wet days if you have?**

Answer 26: Bias correction was performed in the same way for all variables.



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**Question 27: Can the data be downloaded and used for hydrological modeling?**

Answer 27: Yes.

**Question 28: I want to know about the climate resilience in urban areas from the urban heat island. What are the climate models that I can apply to?**

Answer 28: Any of the climate models are applicable. The GCMs don't output their results on the same grid and results depend on your application.

**Question 29: What is the resolution of original data that NEX is downscaling?**

Answer 29: It varies by model, anywhere from approximately 100 km to 200 km.

**Question 30: Do you think it would be safe to use the NEX-GDDP-CMIP6 projections for further downscaling (to 1km) in one's area of interest using the BCSD method? Historical reference would be different (e.g., CHELSA-W5E5)**

Answer 30: I don't see any issue with that. NEX-DCP30 is an 800-meter product that is useful for CONUS: <https://data.nas.nasa.gov/nex-dcp30-cmip6>

**Question 31: For bias corrections, how did you manage to get observation data from everywhere over the globe?**

Answer 31: The reference dataset (GMFD) is a global gridded reanalysis product.

**Question 32: How is this data going to complement other NWP and reanalysis datasets including the data from ECMWF? ECMWF has much more granular resolution.**

Answer 32: ECMWF is for weather forecasting (medium range, 3-6 months).

**Question 33: Is there a Python version available for these codes?**

Answer 33: No there is not. This is something to consider for future applications. There are Python programs we will cover next week.

**Question 34: Thank you for the workshop. I'm interested in when GDDP-CMIP6 Version 2 will be released?**

Answer 34: It is available on NCCS and on AWS.

**Question 35: I am working at the watershed-level. So, is it generally better to use Regional Climate Model (RCM) data or Global Climate Model (GCM) data for such**



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**studies? Additionally, in this context, which downscaling method—dynamic or statistical—would be more appropriate and reliable?**

Answer 35: As far as applicability and reliability are concerned, there are many factors and it is dependent on application.

**Question 36: Is there some guidance document/best-practice/article for the way on how many and which models to select in building an ensemble time series for a particular region or adaptation application?**

Answer 36: Be sure to check literature to see if any research has been conducted in your specific region of interest.

**Question 37: On further BCSD downscaling - would it be OK to filter out (narrow) set of model projections? Is there a rule of thumb for narrowing?**

Answer 37: It is dependent on application and literature and research would assist you for your region of interest. It is also dependent on risk tolerance for your application.