Earth Syst. Sci. Data Discuss., 8, C283–C299, 2015
www.earth-syst-sci-data-discuss.net/8/C283/2015/

Open Access Earth System Science Data Discussions

Interactive comment on "A global satellite assisted precipitation climatology" *by* C. Funk et al.

C. Funk et al.

chris@geog.ucsb.edu

Received and published: 2 September 2015

Anonymous Referee 1 Received and published: 8 July 2015

Summary: The authors provide a technical overview and performance evaluation of a new global precipitation climatology derived using in situ climate normals, satellite data, physiographic variables, and a novel interpolation technique. The product is an important contribution for climate analysis in data sparse regions, both because it offers what appears to be a superior precipitation climatology relative to other widely used products and because it forms the foundation for the CHIRP and CHIRPS precipitation monitoring systems. Many researchers now employ CHIRP/S for studies of climate and hydrology in tropical regions, and this paper provides useful documentation on the

process used to generate the underlying climatology.

———- Response: We appreciate reviewer 1's assessment of our paper, and the time spent reviewing this document. ————————————————————-

The paper is clearly presented and includes all essential detail for potential users of the data product. I believe that it can be published in final form after only minor revision. That said, I suggest that the paper would benefit from additional figures (with associated supporting text) that address key performance indicators and product interpretation. Proposed additional figures include: 1. A map of the final product! It seems odd to read a paper that introduces a precipitation climatology and never see what the dataset looks like. It might be appropriate to show difference maps with CRU or Worldclim as well, though it might be more informative to show those differences for specific regions rather than at global scale.

———- Response: In response to this request we have added a figure, between the current Fig. 5 and Fig. 6, that shows maps of the CHPclim. Plots of the differences between the products have been also been added as an additional figure as described below. ——————————————————-

2. Spatial comparisons of CHPclim performance with that of CRU and Worldclim in selected focus countries. For example, a map of bias (or MAE, or temporal correlation) at evaluation stations in Ethiopia during the rainy season would enrich the authors' claims that CHPclim offers its greatest advantages over complex terrain and data limited regions.

———– Response: This is a great suggestion, we have added three figures between the current Fig. 7 and Fig. 8 that addresses this request. These figures focus on Ethiopia, because we have just completed a rainfall gridding workshop at the Ethiopian meteorological agency, and hence have a good validation data set based on 208 independent gauge observations. More heuristic than quantitative, we focus in this example on describing some specific instances where the satellite information provides valuable information about precipitation gradients in data sparse regions. ————————————————————————————————

———– 3. The general conclusion that the satellite-assisted CHPclim product offers greater reliability in complex terrain is quite interesting, considering that rough terrain is often identified as a major challenge for microwave precipitation estimates. It would be interesting to see a figure that plots error in CHPclim and in the comparison products as a function of elevation and/or other topographic characteristics in order to substantiate this claim. ————————————————————————————– Response: Please see our above response. In our Ethiopia case study we identify places where either a) very steep elevation gradients appear associated with large errors in the current state-of-the-art climatologies or b) satellite rainfall (but not elevation data) provides valuable information about rainfall extrema. ———————————————————————————-

4. As a corollary to 3, it would also be interesting to see maps or scatterplots that show how CHPclim differs from other products in estimated precipitation at very high elevations–i.e., elevations higher than most or all available stations. It won't be possible to evaluate performance in these zones, but simply characterizing the difference is important for hydrological applications and trend analysis. ———————————————————————————– Response: This is a good suggestion, but rather than scatterplots we simply provide a heuristic discussion. The story that emerged from our analysis suggested that it was more about the relationship between elevation and precipitation gradients. Without explicit knowledge about the specific station distributions used in the other climatologies, this is the most

we can do at present we feel without greatly expanding the length and complexity of the current study. —————————————————————————————-

Minor comments / typos: p. 405, line 1: I only see four satellite products on this list, but the text states there were five. The "fifth predictor" introduced in line 16 is an average of two satellite products and is not an independent product. ———————————————————————————– Response: we will request that this be changed to "Monthly means of four satellite products". —————————————————————————————————-

p. 405, line 20: slope is listed twice ——————————————————————————– Response: Thanks, we are requesting that the first slope be removed. ——————————————————————————-

p. 411, line 16: please explain why the thin plate spline would fail in this regard. ——————————————————————————– Response: We are requesting that a sentence be added to this paragraph: "Thin plate splines fit polynomial surfaces through point data, creating a generalized surface fit to latitude, longitude and elevation, the suitability of this fitting process may be problematic when the density of the gauge data is very low. Later in our paper we compare different products in Ethiopia." ——————————————————————————————-

PLEASE SEE OUR ATTACHED PDF WHICH HAS OUR REQUESTED CHANGES.

Please also note the supplement to this comment:
http://www.earth-syst-sci-data-discuss.net/8/C283/2015/essdd-8-C283-2015-supplement.pdf

Interactive comment on Earth Syst. Sci. Data Discuss., 8, 401, 2015.

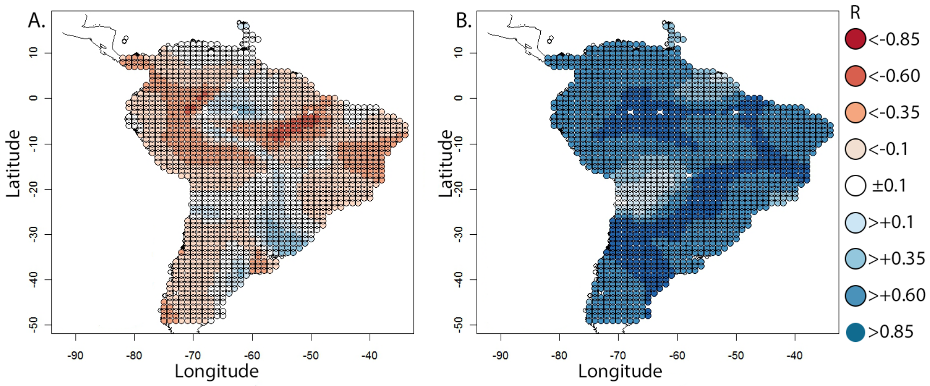

Fig. 1. Figure 1. Local correlations with July station means. (a) Elevation. (b) Combined TRMM/CMORPH precipitation.

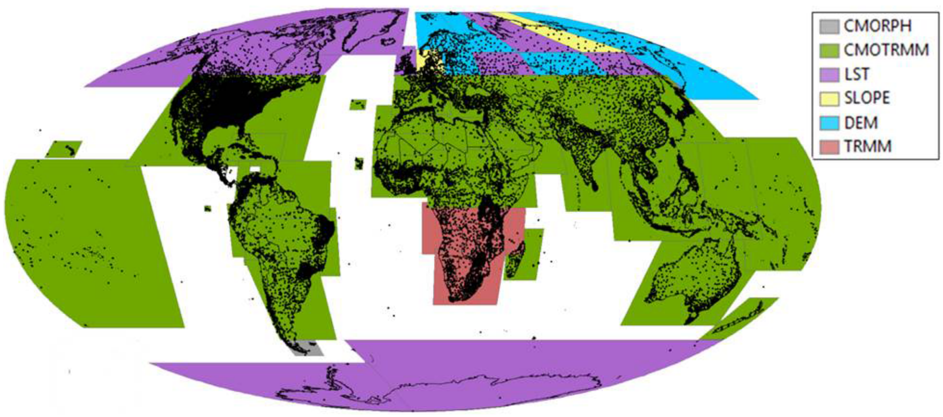

Fig. 2. Figure 2. Best predictor, by model region, with station locations.

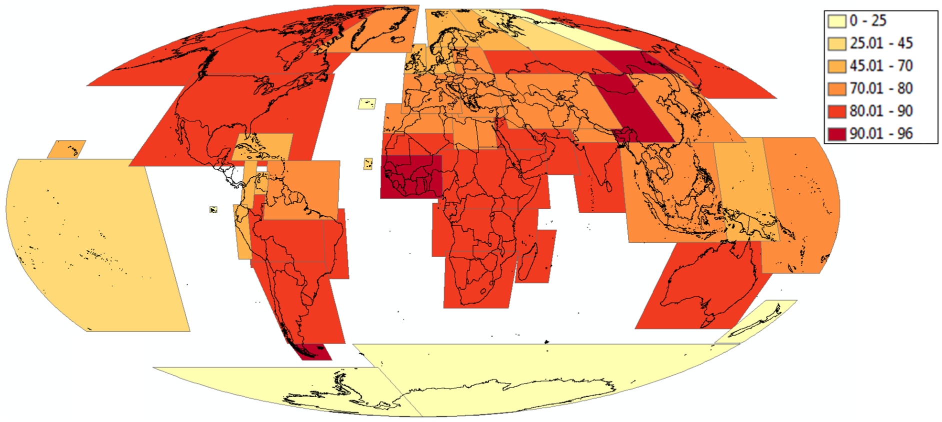

Fig. 3. Figure 3. Percent of variance explained by cross-validated moving window regression.

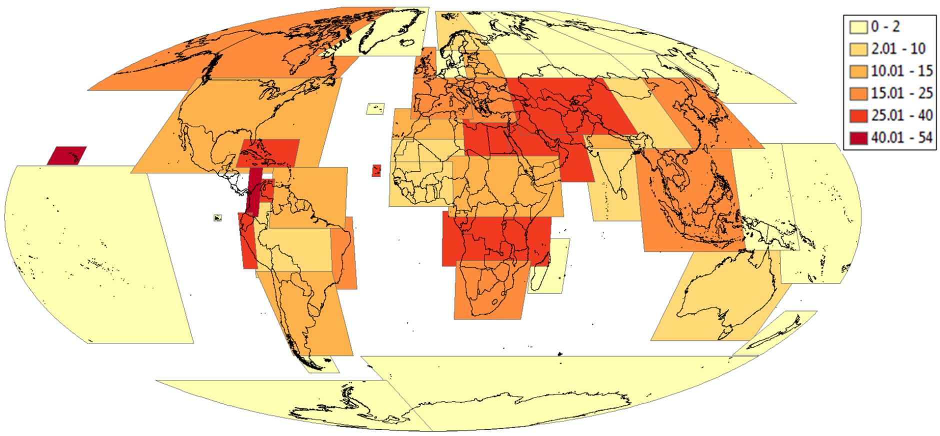

Fig. 4. Figure 4. Percent of variance explained by cross-validated inverse distance weighting.

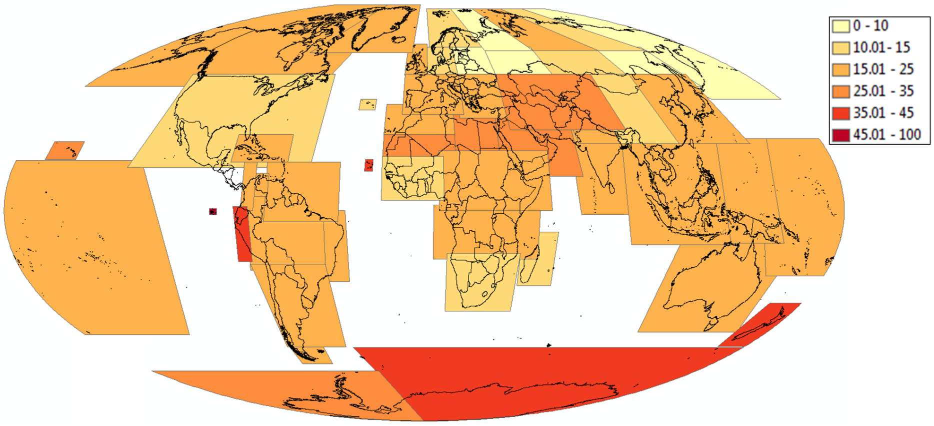

Fig. 5. Figure 5. Percent standard error explained by cross-validation.

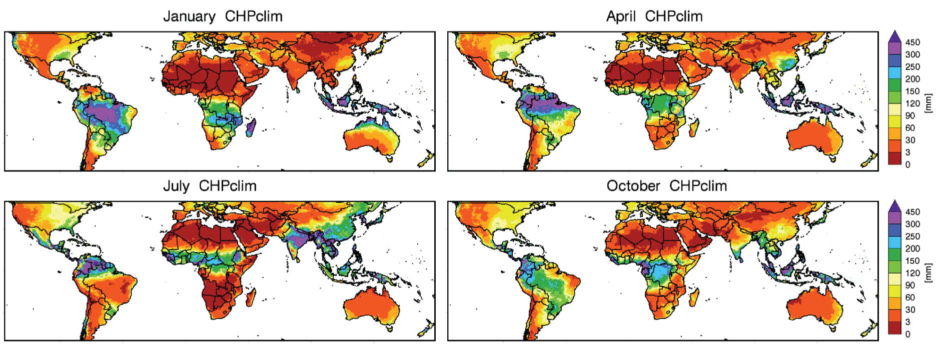

Fig. 6. Figure 6. CHPclim monthly means for January, April, July and October. While CHPclim is global, we show 50°S-50°N images to facilitate visualization.

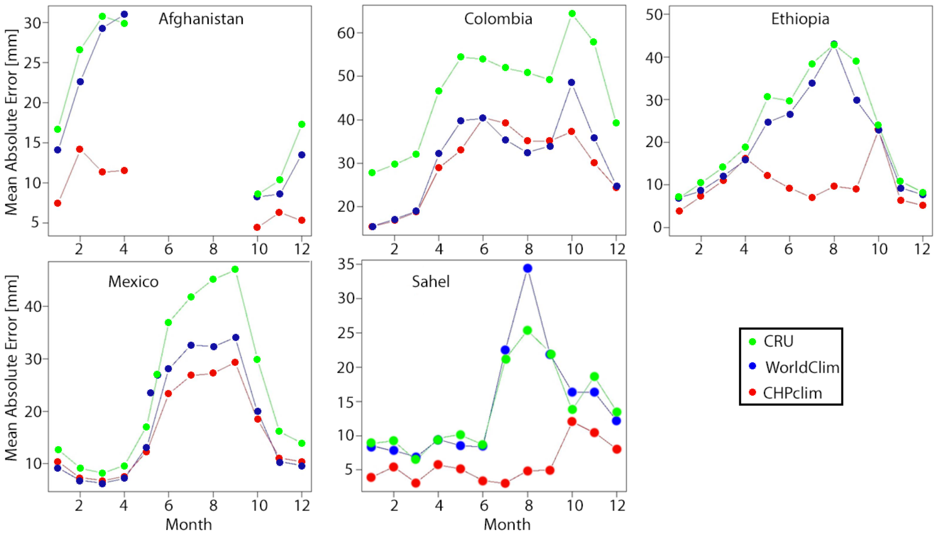

Fig. 7. Figure 7. Mean absolute error time series [mmmonth -1].

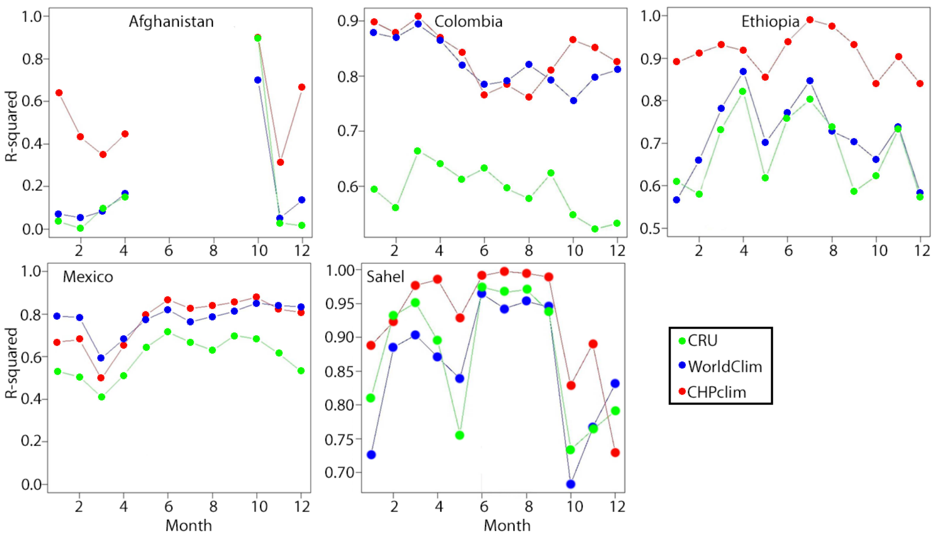

Fig. 8. Figure 8. Spatial R2 time series.

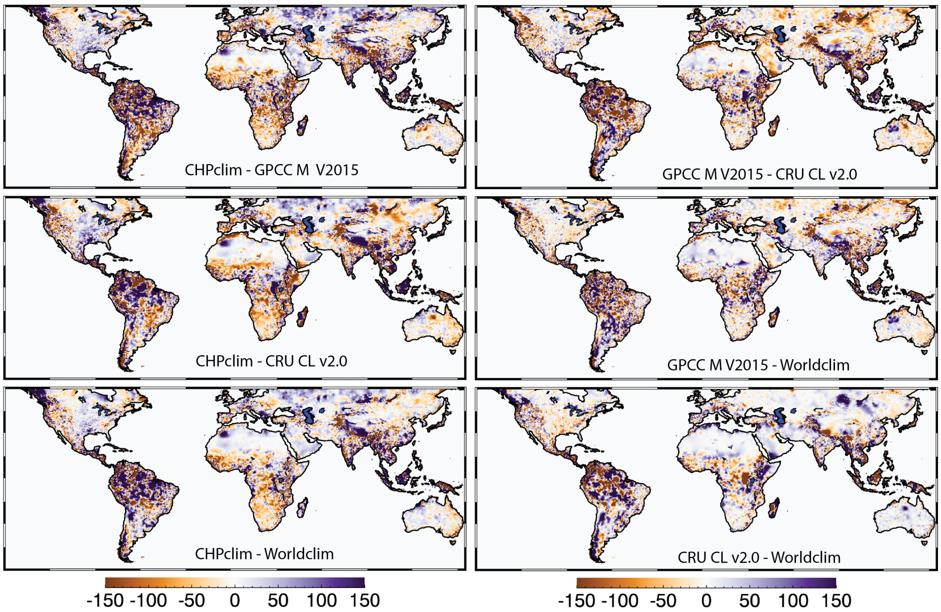

Fig. 9. Figure 9. Differences in annual total precipitation for CHPclim, the 0.25° GPCC M V2015 climatology, the 0.17° CRU CL v2.0, and the 0.042° version 1.4 release 3 Worldclim climatology.

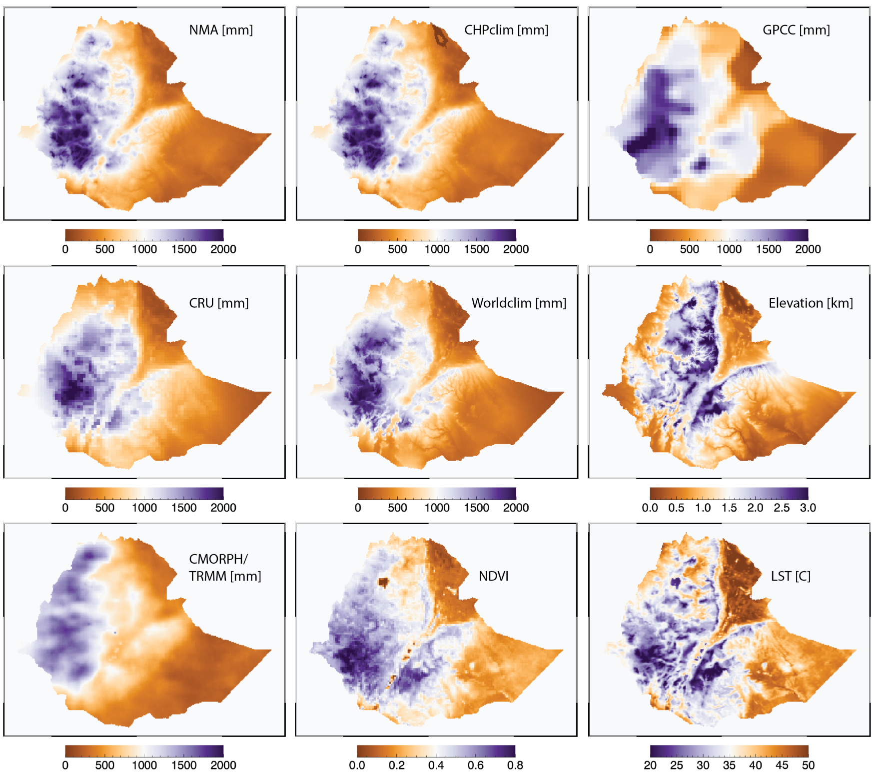

Fig. 10. Figure 10. Total annual rainfall, elevation, NDVI and LST for Ethiopia. Rainfall totals are from the Ethiopian National Meteorological Agency (NMA), CHPclim, the GPCC M V2015 climatology, the CRU CL

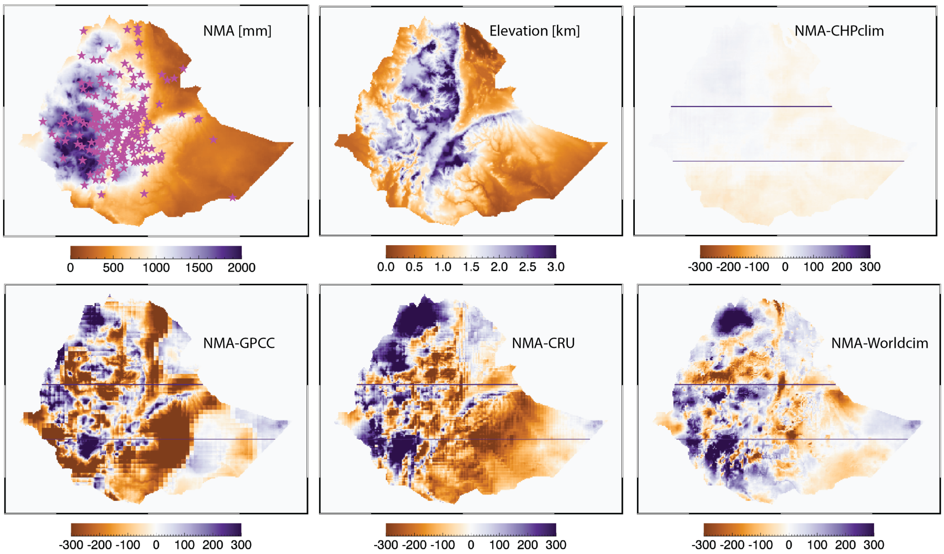

Fig. 11. Figure 11. Total annual NMA rainfall, elevation and MBE maps based on the NMA minus CHPclim, the NMA minus GPCC, the NMA minus CRU and the NMA minus Worldclim.

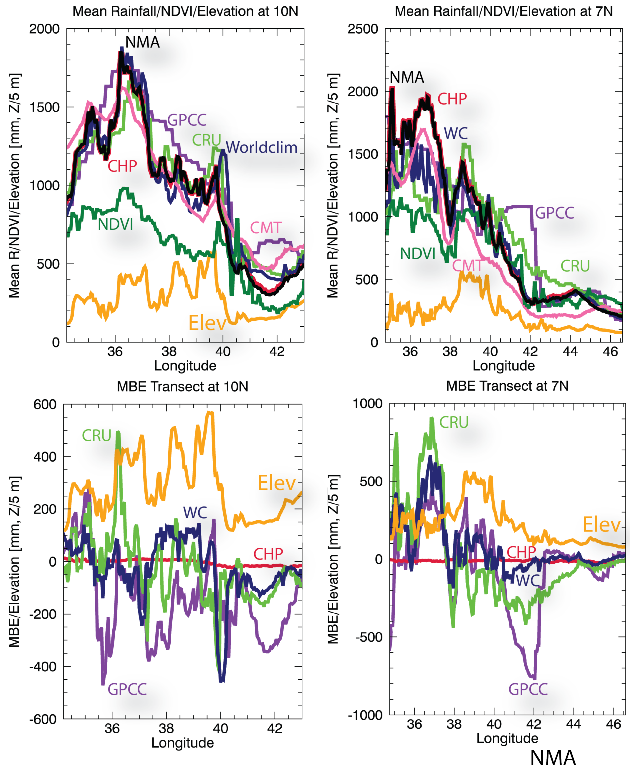

Fig. 12. Figure 12. The top panels show transects of total annual rainfall at 7°N and 10°N. Also shown are transects of elevation in meters divided by 5 and annual mean NDVI, multiplied by 1500. The bottom pan

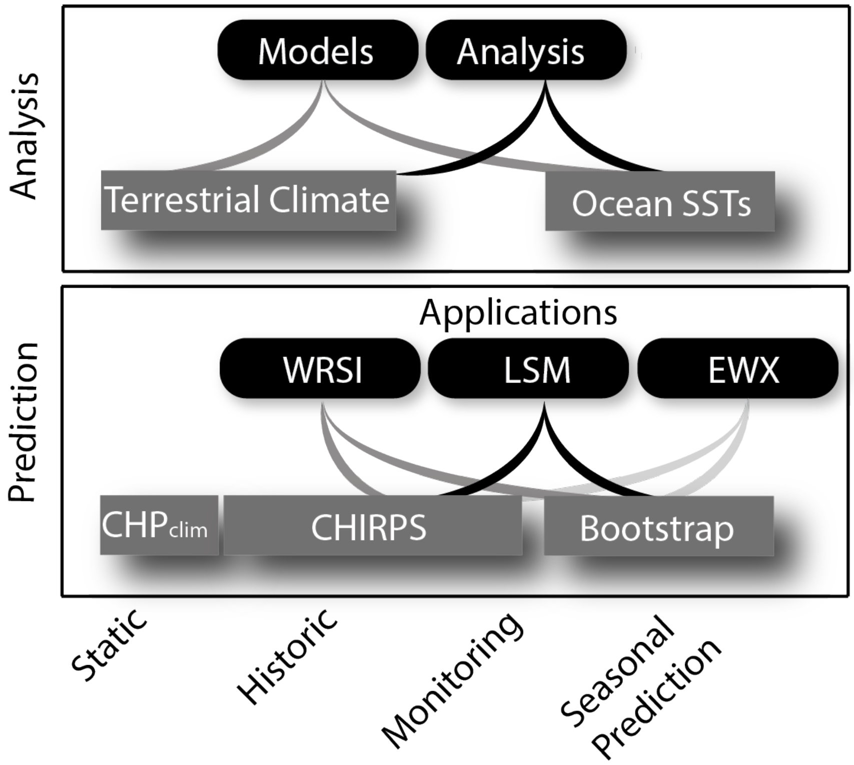

Fig. 13. Figure 13. Schema of CHG analysis and prediction activities.