Validation ERA5 with NCDC weather station

Sample of 371 Latin American Cities across Koeppen Climate Zones

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Many researchers involved in SALURBAL are interested in using historical temperature reanalysis data. For that reason, we validated the product ERA5 hourly data on single levels from ECMWF with NCDC weather station data across different Koeppen climate regions represented in SALURBAL cities. As a brief overview, from the 371 cities, 166 are categorized as tropical (group A), 79 as dry (group B), 125 as temperate (group C) and 1 as polar (group E). No continental climate zones (group D) are represented in SALURBAL cities.

In order to carry out the validation process, we examined daily average temperature data over 2 years, from **January 1, 2018 to December 31, 2019**. The data product for NCDC is *Global Summary of the Day* and captures a minimum of 4 observations per day. The data product for ERA5 is *t2m* and has an hourly, 30 km scale. In order to homologate these two data sources, we specify if the NCDC data is produced by a weather station in an airport, the mean of number of hourly observations per day, and the number of values captured in the 2 year period.

From the 371 cities, 17 cities were selected: 7 in tropical, 5 in dry, and 5 in temperate zones. From the 17 cities, 7 are coastal to have an idea of how correlated are pixels that can be impacted by the presence of water.

Table 1 describes the relationship between both datasets:

Table 1: Comparing NCDC and ERA5 Daily Temperature Estimates from January 2018 to Dec 2019

Climate zone	Group	Country	UX	Intercept of Regression	Pearson Correlation	Airport NCDC	Airport ERA5	# obs NCDC	# obs ERA5	Mean #hours captured (NCDC)	Temp range NCDC[1]	Temp range ERA5[1]	Coastal?
Tropical	A	Mexico	Acapulco	-3.54	0.791**	No	No	714	730	7.25	8.33	5.32	Yes
Tropical	A	Brazil	Campos dos Goytacazes	2.20	0.961**	Yes	Yes	723	730	14.64	15.00	12.59	No
Tropical	A	Mexico	Tuxtla Gutierrez	4.97	0.921**	Yes	Yes	723	730	20.52	15.17	13.47	No
Tropical	A	Colombia	Palmira	-0.74	0.691**	Yes	Yes	723	730	23.67	10.67	3.39	No
Tropical	A	Mexico	Ciudad del Carmen	-2.22	0.935**	Yes	Yes	723	730	15.87	12.28	9.32	Yes
Tropical	A	Colombia	Barrancabermeja	4.27	0.756**	Yes	Yes	717	730	12.81	8.44	7.12	No
Tropical	A	Brazil	Recife	-4.53	0.904**	Yes	Yes	705	730	22.41	7.61	5.52	Yes
Dry	B	Argentina	Jujuy	1.69	0.947**	No	No	723	730	23.60	25.06	19.55	No
Dry	B	Mexico	Ciudad Victoria	-1.02	0.968**	Yes	Yes	664	730	5.87	36.67	29.58	No
Dry	B	Peru	Pisco	-0.27	0.971**	Yes	Yes	723	730	23.53	11.33	10.39	Yes
Dry	B	Peru	Lima	-2.31	0.978**	Yes	Yes	581	730	23.59	11.55	9.04	Yes
Dry	B	Chile	La Serena–Coquimbo	0.49	0.901**	Yes	Yes	723	730	23.37	11.50	11.99	Yes
Temperate	C	Mexico	Morelia	0.55	0.919**	No	No	720	730	6.60	17.56	15.23	No
Temperate	C	Colombia	Bogota	0.71	0.691**	Yes	Yes	723	730	23.75	6.61	4.60	No
Temperate	C	Chile	Los Angeles	-0.33	0.953**	Yes	Yes	717	730	9.27	29.94	23.20	No
Temperate	C	Argentina	Buenos Aires	1.19	0.994**	No	No	722	730	14.80	26.44	26.18	Yes
Temperate	C	Brazil	Porto Alegre	0.41	0.995**	Yes	Yes	723	730	23.76	24.11	24.46	Yes

[1] Range estimated across the 2 years

Access to raw data:

- **ERA5 hourly data on single levels:**
  https://cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels (?tab=overview
- **NCDC Daily Summary of the Day - new version:**
  https://www.ncei.noaa.gov/access/search/data-search/global-summary-of-the-day
- **NCDC Daily Summary of the Day:**
  https://www7.ncdc.noaa.gov/CDO/cdoselect.cmd?datasetabbv=GSOD&countryabbv=&georegionabbv=

Please go to github (https://github.com/ifarah/salurbal_era5_ncdc) for **data-processing** and **plots**.