

AMAZON PROJECT: EXPLAINING WEATHER SYSTEMS

The weather system is complex and there is no single way to explain it. Narratives about the weather system should be matched with the audience. For students in early education up to secondary education, the weather system can be explained in simple language aided with daily life analogies. The narrative is accompanied by graphics to make the text more understandable.

INTERACTIVE SYSTEM OF THE APP

The app aims to provide almost real-time data regarding the weather variables as follows:

- Air temperature
- Rainfall (hourly and daily)
- Clouds
- Evaporation
- Soil Moisture
- Vegetation (LAI)
- GPP
- NDVI

The children can compare these data with real-life observation near by To provide a bigger picture and broader understanding about these variables, there are explanation narratives included in the app.

When a student accesses certain weather variable data e.g. temperature, a window appears which contains explanation on the one-to-one effect that the variable have with other variables and also how the variable is a part of a correlation chain. The explanation comes with text and an image that demonstrate the one-to-one effect and correlation chain.

DESCRIPTION OF VARIABLES (TECHNICAL)

Layer	Description	Frequency of update	Spatial resolution	Unit	Range of variable	Layer link	Bandname used
Air temperature	Temperature of air at 2m above the surface of land, sea or inland waters. 2m temperature is calculated by interpolating between the lowest model level and the Earth's surface, taking account of the atmospheric conditions.	Daily	11132 metres	Celcius	[123.25, 1037.55]	https://developers.google.com/earth-engine/datasets/catalog/ECMWF ERA5_LAND_DAILY_AGGREGATED	'temperature_2m'
Surface temperature	Average Daytime Land Surface Temperature	Monthly (aggregated)	11132 metres	Celcius	[-50, +75]	https://developers.google.com/earth-engine/datasets/catalog/MODIS_061_MOD21C3	'LST_Day'
Clouds	Retrieved effective radiometric cloud fraction	Daily	1113.2 metres	Clouds fraction	0-1	https://developers.google.com/earth-engine/datasets/catalog	'cloud_fraction'

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Rainfall (Hourly)	Snapshot of hourly precipitation rate	Hourly	11132 metres	(mm/hr)	[0, 204.88]	https://developers.google.com/earth-engine/datasets/catalog/JAXA_GPM_L3_GSMaP_v6_operational	'hourlyPrecipRate'
Rainfall (Daily)	Accumulated liquid and frozen water, including rain and snow, that falls to the Earth's surface. It is the sum of large-scale precipitation (that precipitation which is generated by large-scale weather patterns, such as troughs and cold fronts) and	Daily	11132 metres	(m)	[0,1]	same as air temperature	'total_precipiation_sum'

	convective precipitation (generated by convection which occurs when air at lower levels in the atmosphere is warmer and less dense than the air above, so it rises).						
Evapotranspiration	Accumulated amount of water that has evaporated from the Earth's surface, including a simplified representation of transpiration (from vegetation), into vapor in the air above. This variable is accumulated from the beginning of the forecast to the end of the forecast step.	Monthly (aggregated)	11132 metres	m of water equivalent	[0,-0.15]	https://developers.google.com/earth-engine/datasets/catalog/ECMWF ERA5_LAND_MONTHLY_AGGR	'total_evaporation_sum'

Soil Moisture	top layer soil moisture (0-5 cm)	Every 3 hours (averaged)	11000 metres	Volume fraction	0-0.9	https://developers.google.com/earth-engine/datasets/catalog/NASA_SMAP_SPL4SMGP_007	'sm_surface'
Vegetation (LAI)	Leaf Area Index	Every 16 days	500 metres	LAI (Area fraction)	[0-4]	https://developers.google.com/earth-engine/datasets/catalog/NOAA_VIIRS_001_VNP15A2H#bands	'Lai'
GPP	Gross primary production	Every 8 days	500 metres	Kilograms * Carbon per square metre (kg*C/m ²)	[0, 0.3]	https://developers.google.com/earth-engine/datasets/catalog/MODIS_061_MOD17A2H	'Gpp'

NDVI	16-day NDVI average	Every 16 days	1000 metres	no unit (just NDVI)	[-0.2, 1]	https://developers.google.com/earth-engine/datasets/catalog/MODIS_061_MOD13A2	'NDVI'
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DESCRIPTION OF VARIABLES FOR CHILDREN

Air Temperature

Do you feel warm or cold? You are feeling the air temperature. If it's high, it's a warm day, and if it's low, it's a cool day. The information and layer you see shows what's the temperature is like outside. It currently shows the temperature of 10 days ago.

Clouds

The clouds are composed of water droplets in the sky, and they come in different shapes and colors. When clouds become big and grey, we can expect rain! So, clouds can tell us whether it will rain, or it will be a sunny day! This layer shows us how many clouds have been there during the last week. The information and layer you see shows how many clouds were floating above a spot on Earth over the past week.

Rainfall (hourly)

Rainfall is water droplets falling from the sky. This layer shows us how much rain falls in an area over the last hours. It helps farmers, scientists, and all of us understand if it's going to be a rainy or dry day! The information and layer you're looking at shows the total hourly rainfall, approximately 14 hours.

Rainfall (daily)

Rainfall is water droplets falling from the sky. This layer shows us how much rain falls in an area in the last days. It helps farmers, scientists, and all of us understand if it's going to be a rainy or dry day! The information and layer you're looking at shows the total daily rainfall, precisely 10 days ago.

Evapotranspiration (monthly)

Evaporation is the process where liquid water turns into water vapor. This layer helps us see how much water turns into vapor from the ground. It's like nature's way of cooling down and making clouds! Water in the ground also turns to water vapour through plants. Plants breathe like humans do, and when they breathe, they release water vapour through the process called transpiration. Evaporation from the ground and transpiration from the plants are combined into evapotranspiration. The information and layer you're looking at shows the total amount of evaporation in the previous month.

Soil Moisture

Soil moisture is like checking if the ground is thirsty or happy! This layer helps us see how much water is in the soil. It's super important for farmers and plants to know if the soil is dry or wet! The information and layer you're looking at shows the wetness of the soil from 3 days ago.

Vegetation (LAI)

Vegetation is like a green carpet on Earth! This layer helps us see how much green stuffs, also known as plants, are growing. It's important for nature, animals, and scientists to know if an area has lots of healthy plants or just a little bit! The information and layer you see shows how much vegetation there is on a spot on Earth, roughly 2 weeks ago from now.

GGP

Green Growth Potential tells us if a place has the perfect conditions for plants to grow. It's like nature's way of saying, 'Let's grow some green!' The information and layer you see shows where plants can grow well on Earth, roughly 2 weeks ago from now.

NDVI

NDVI, or the "Normalized Difference Vegetation Index," helps us understand how much healthy green vegetation is present in an area. It uses colors to show whether an area has a lot or a little vegetation, making it easier for us to study plants and their health from space! 🌱 📱 The information and layer you see show healthy the plants and trees on Earth are. These images were taken no more than a month ago.