

Notes on variables

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Temperature

<https://geography.name/surface-and-air-temperature/>

Air temp, typically measured at 1.2m above the ground

Dependant on:

1. Latitude
2. Surface Type
3. Coastal/Inland
4. Elevation
5. Atmospheric/Oceanic circulations

LST - Land Surface Temperature

Temperature of the actual surface, slightly different to air temp

Can be measured through either satellites (which gives much larger spatial resolution), or on-ground equipment (more accurate, but sensitive to emissivity differences from various surfaces, and also much more localised)

Also more likely to be extreme than air temperature, due to certain surfaces being much more absorptive of heat than others. Notable examples include asphalt, can potentially burn pets paws in extremes of summer

U, V, W_{speed}

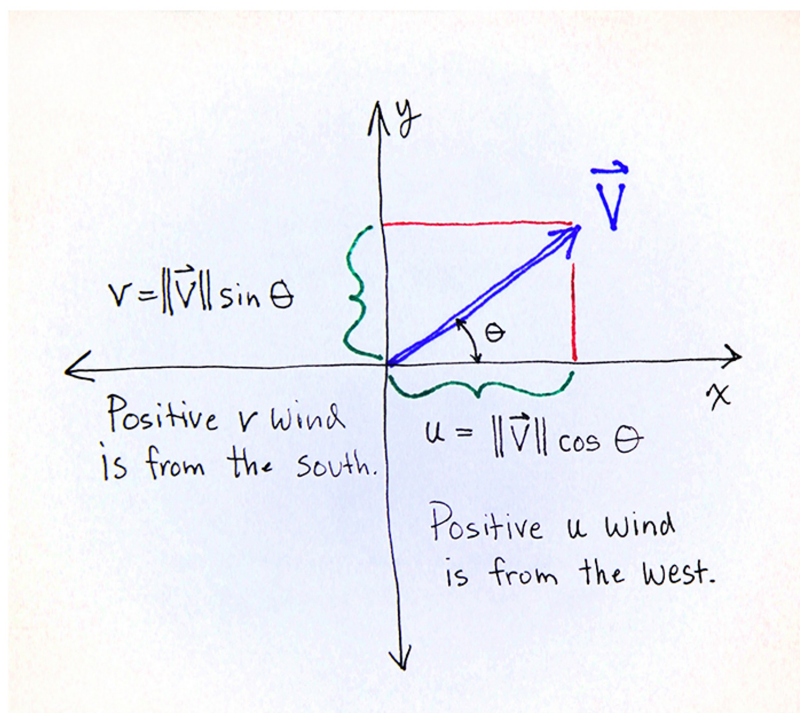
Wind speed vectors, and total (?) wind speed in given direction

Typically given in 1 hour, 3 hour, 6 hour, 1 day, 1 month, or "1 constant" segments (don't know what this constant is)

$$u = ws * \cos(\theta)$$

$$v = ws * \sin(\theta)$$

where θ is the wind direction using "math" direction, and ws is the wind speed (ie, the magnitude of the wind vector). See below:



Measured in Knots, Mph, easy to convert to m/s

Beaufort Force	Description	When You See or Feel This Effect	Wind (mph)
0	Calm	Smoke goes straight up	less than 1
1	Light air	Wind direction is shown by smoke drift but not by wind vane	1-3
2	Light breeze	Wind is felt on the face; leaves rustle; wind vanes move	4-7
3	Gentle breeze	Leaves and small twigs move steadily; wind extends small flags straight out	8-12
4	Moderate breeze	Wind raises dust and loose paper; small branches move	13-18
5	Fresh breeze	Small trees sway; waves form on lakes	19-24
6	Strong breeze	Large branches move; wires whistle; umbrellas are difficult to use	25-31
7	Moderate gale	Whole trees are in motion; walking against the wind is difficult	32-38
8	Fresh gale	Twigs break from trees; walking against the wind is very difficult	39-46
9	Strong gale	Buildings suffer minimal damage; roof shingles are removed	47-54
10	Whole gale	Trees are uprooted	55-63
11	Violent storm	Widespread damage	64-72
12	Hurricane	Widespread destruction	73+

Can download this data from MERRA-2 for example:

<https://disc.gsfc.nasa.gov/datasets?project=MERRA-2>

Precipitation

Any kind of water coming from the sky

Typically given with value of 0-100%, rough value of the chance that you will see rain in a certain area

Rainfall

Given in mm/hour (at least on Met Office)

Can also be given as a value per year, but obviously not useful for at current time data, more useful for long term comparisons

Chemical Abundances

Can potentially take multiple sources for each

Measured in potentially various ways, e.g.

CO₂

Main one of focus

NO₂

O₃

Air Pollution/Quality

<https://www.metoffice.gov.uk/weather/guides/air-quality>

Given by the "Daily Air Quality Index"

Typically a daily index, not possible to do shorter time scales without muddying the data

Works on 12km resolution grid

Represents background and regional air pollution

Doesn't represent increases that may be seen next to places of higher pollution e.g. roads, industrial sectors

Measured from 1 to 10, 4 bands with varying colours for each

Can download data from

<https://uk-air.defra.gov.uk/data/DAQI-regional-data>

Different chemicals have different bands and different temporal resolutions

Band	Index	Ozone	Nitrogen Dioxide	Sulphur Dioxide	PM _{2.5} Particles	PM ₁₀ Particles
		Running 8 hourly mean	Hourly mean	15 minute mean	24 hour mean	24 hour mean
		µg m ⁻³	µg m ⁻³	µg m ⁻³	µg m ⁻³	µg m ⁻³
Low	1	0-33	0-67	0-88	0-11	0-16
	2	34-66	68-134	89-177	12-23	17-33
	3	67-100	135-200	178-266	24-35	34-50
Moderate	4	101-120	201-267	267-354	36-41	51-58
	5	121-140	268-334	355-443	42-47	59-66
	6	141-160	335-400	444-532	48-53	67-75
High	7	161-187	401-467	533-710	54-58	76-83
	8	188-213	468-534	711-887	59-64	84-91
	9	214-240	535-600	888-1064	65-70	92-100
Very High	10	241 or more	601 or more	1065 or more	71 or more	101 or more

Presumably index value is taken for each of the constituent molecules and particles, then combined mean index value is found?

Collected from the AURN network, measures pollutant concentrations on an hourly basis

Forecasts uses real time measurements to adjust predictions, creates average emission maps over large areas rather than localised areas