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Team Building Activity

Workshop 7: Use, Analysis and Visualisation of Geodata -*Dr. Klaus Albrecht (PHT)*

9:30

11:00

Dr. Nikolaus Albrecht, MSc

MINT-Koordinator | STEM-coordinator

Institut für Sekundarpädagogik Department of Secondary Education



Pädagogische Hochschule Tirol University College of Teacher Education

Pastorstraße 7 / Gebäude A / OG02.018.00 A-6020 Innsbruck Mobiltelefon: +43 664 73417023 E-Mail-Adresse: <u>nikolaus.albrecht@ph-tirol.ac.at</u> Workshop 7: Use, Analysis and Visualisation of Geodata -Dr. Klaus Albrecht (PHT)

HOW IS IT ALL ORGANISED?

INPUT PHASE (lean back, relax and watch as I guide you through the first part of the session)

EXAMPLES: Together, we will work on the examples, which were only presented before.

PRACTICE: Now it just needs a lot of practice.

https://portal.geoacademy.eu/



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A community of practice of educators for sustainable development across Europe.





CODAP = Common ...

Online Data Analysis Platform

(Workshop Title: Use, Analysis and Visualization of Geodata)

Of course, meanwhile you can find everything on the internet, but if – for example – the mean value (in a data set) has no meaning for you, a lot of things (out there) may be meaningless. You could be vulnerable to manipulation.

Data records made up out of (thin) air

For someone who has respiratory problems, the question of air quality can be important. A forest fire close to home could have an impact on air quality. But how can we find out?

We will analyse the air quality during and after the Bighorn Wildfire (5 June to 23 July 2020) in the nearby city of Tucson, Arizona.

To be able to do this at all, we need data.

AGAIN ...



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read more





https://firms.modaps.eosdis.nasa.gov/map The FIRMS website is a tool provided by NASA's Fire Information for Resource Management System. It provides near real-time information on active fires around the world based on satellite data. Users can view and analyse global... read more



CODAP

CODAP (Common Online Data Analysis Platform) is a

https://firms.modaps.eosdis.nasa.gov/map/



5 June to 23 July 2020, Tucson, Arizona

Aerosol Optical Depth (AOD)

Aerosol Optical Depth (AOD) is a value calculated via satellite measurements of aerosols (e.g., urban haze, smoke particles, desert dust) distributed within a column of air from Earth's surface to the top of the atmosphere.

- 1. **Column with High Aerosol Concentration**: This column contains a significant number of particles, leading to higher light scattering and absorption. As a result, less direct sunlight reaches the ground, corresponding to a higher AOD value.
- 2. Column with Low Aerosol Concentration: This column has fewer particles, resulting in minimal scattering and absorption of sunlight. Consequently, more direct sunlight reaches the ground, corresponding to a lower AOD value.



The data were collected by NASA's Terra satellite and accessed through the myNASAdata website.



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my NASA data

My NASA Data is an educational platform designed to make NASA's Earth science data accessible to students, educators, and lifelong learners. The website offers a wealth of resources, including interactive tools, lesson plans, and real-world data sets, to support the... **read more**

TERRA

Terra is a key NASA mission dedicated to studying Earth's systems from space, providing vital data for understanding our planet's climate, environment, and natural processes. Launched in 1999, the Terra satellite carries a suite of advanced scientific instruments that... **read more**

Fortunately for us, someone has already gone to the trouble of plucking the data from the Internet for us.

Download the data and save the file on your computer (for later

use):

Data.csv



a my NASA

CODAP gets the data talking

Visit the following site:

Common Online Data Analysis Platform (CODAP)

https://codap.concord.org/

Launch CODAP ...



CREATE NEW DOCUMENT



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We select the data file previously downloaded ...



If everything went well, the data sets will now appear in the programme:

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78	August	8/27/20	32.13	-110.96	0.32		107.06	0	6
79	August	8/28/20	32.13	-110.96	0.21		107.06	0	6
80	August	8/29/20	32.13	-110.96	0.1		98.96	0.11	8
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Now it is time to give our document a name and save it:

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Get to know your data

We have 82 data entries. A wide range of information is entered for each data entry. If you hold the mouse over a data field, detailed information is displayed:

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		5	June	6/6/20	32.1	3 -110.96	0.03		93.92	0		7.38		
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		16	June	6/17/20	32.1	-110.96	0.04		100.94	0		10.51		
		17	June	6/18/20	32.1	-110.96	0.05		100.94	0		8.28		
		18	June	6/19/20	32.1	-110.96	0.06		100.94	0		6.71		
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You will find a total of nine attributes (columns) for each of the 82 data entries (rows). An attribute can be numerical or categorical.

Aerosol optical depth (AOD) is calculated from satellite measurements of changes in the reflections and absorption of visible and infrared light due to particles in the atmosphere.

The data for AOD, temperature and other attributes were selected for a three-month period during which a large forest fire, known as the Bighorn Fire, occurred near Tucson, Arizona.

Juggling with data

The 'Graph' menu item initially shows us the entire, unorganised 'data cloud'.

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47	July	7/21/20	32.13	-110.96	0.05		102.92	0	7.61						
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If we drag the `Month' attribute onto the horizontal axis with the mouse, our pile of data already looks tidier.

Let's drag another attribute onto the horizontal axis:

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1	June	6/1/20	32.13	-110.96	0.04		100.94	0.04	7.61		ute		•							•
2	June	6/2/20	32.13	-110.96	0.03		104	0.01	7.38		ribi		ě.							
3	June	6/3/20	32.13	-110.96	0.04		105.08	0	5.82		att		0 0 0							•
4	June	6/4/20	32.13	-110.96	0.05		107.96	0	5.82		an		0 CO 0 (0							hills.
5	June	6/6/20	32.13	-110.96	0.03		93.92	0	7.38		00		500 500							
6	June	6/7/20	32.13	-110.96	0.03		93.92	0	9.17		rd		0.0							
7	June	6/8/20	32.13	-110.96	0.03		89.96	0	9.17		0		010 010							\$
8	June	6/9/20	32.13	-110.96	0.04		93.02	0	5.14		Jer.									•
9	June	6/10/20	32.13	-110.96	0.03		102.02	0	6.71		X		1000							
10	June	6/11/20	32.13	-110.96	0.04		105.08	0	6.26		U				•					Ľ
11	June	6/12/20	32.13	-110.96	0.05		107.96	0	8.05			0	0.05	0.1 0.1	5 0.2	0.25	0.3	0.35	0.4	
12	June	6/13/20	32.13	-110.96	0.05		105.98	0	10.29						AOD					
13	June	6/14/20	32.13	-110.96	0.05		102.92	0	8.28										-	
14	June	6/15/20	32.13	-110.96	0.04		104	0	6.49											
15	June	6/16/20	32.13	-110.96	0.03		102.92	0	10.96	÷										
	-	e ha la a		110.00	0.01		100.01	-												



Why shouldn't we also assign an attribute to the vertical axis? We have enough attributes!

Maybe we'll also try something from the menu bar. How about 'Map'?

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70	August	030010	52.15	-110.90	0.06	107.96	0	7.61	• •										
70	August	8/19/20	32.13	-110.96	0.05	107.05	0.76	0.03	0.5										
100	August	0/20/20	22.15	-110.90	(5.2)	07.00	0.70	0.00	0.36			-							
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76	August	8/25/20	3213	110.95	0.38	107.06		A	40				0	•					
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70	August	8/27/20	32.13	-110.96	0.32	107.06	1121					FFFT							
79	August	8/28/20	32 13	110.96	0.21	107.05	10.21	E Louto Rd				-11			0 to 0 th	0 0			
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81	August	8/30/20	32.15	-110.96	0.06	89.96											-		
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11								Lo Lan						And			oep		
							n M bn S	EAU PRAY LOS	agon Rd E Ehvra Rd	S Park Ave	Laster Powe	red by £sn [

Looks like a lonely data point at the airport. Let's check this with Google maps!



With a little perseverance, we can now start analysing the data. We can mark individual data areas and use such wonderful things as Mean, Median or BoxPlot to find out what the forest fire has done to the data.

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	55	August	8/3/20	32.	13 -110.5	6 0.	15	107.06	0.2		9.84												
	56	August	8/4/20	52.	15 -110.5	6 0.0	16	105.08	0		8.28												
	57	August	8/5/20	32.	13 -110.9	6 0.0	15	105.98	0		7.61												
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	61	August	8/10/20	32.	13 -110.5	6 0.0	15	107.96	0		6.71												
	62	August	8/11/20	32.	15 -110.5	6 0.0	15	105.98	0		6.93												
	63	August	8/12/20	32.	13 110.5	6 0.0)3	107.06	0		6.49												
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	65	August	8/14/20	32	IS -110.9	6 0.0	6	111.02	0		7.61												
	66	August	8/15/20	32	13 -110.5	6 0.0	13	109.04	0		10.07												
	67	August	8/16/20	32.	15 -110.5	6 0.0	15	109.94	0		6.93												
	68	August	8/17/20	52	-110.5	0.0	14	109.04	0		8.72												

I wanted to find out about the optical depth categories of aerosols at 550 nm. For example, what **2** does it mean if the value is below, say, 0.05. Can you provide me with a general categorization table for this?



Aerosol Optical Depth (AOD) at 550 nm quantifies the degree to which aerosols in the atmosphere prevent the transmission of sunlight by absorption or scattering. AOD values range from 0 (completely clear sky) to 1 or more (very hazy conditions).

While there isn't a universally standardized categorization for AOD values, a general classification is as follows:

- AOD < 0.1: Clear conditions with minimal aerosol presence.
- 0.1 ≤ AOD < 0.25: Light aerosol loading, typical of background conditions.
- 0.25 ≤ AOD < 0.4: Moderate aerosol presence, indicating noticeable haze.
- AOD ≥ 0.4: High aerosol loading, leading to significant haze and reduced visibility.

Making sense of data

Note: This dataset is intended for students to find no effect of the wildfire on the AOD for Tucson, Arizona.

The AOD data here are not elevated due to the wildfire. This dataset can be used to help students understand that approaching a dataset with bias or expectation can influence what one finds in the data. There are some higher AOD values toward the end of the data, which students may assume represent the fire.

Deliberate Practice and ...

A Second example ...

Earthquakes

Data Set is here:

earthquakes.csv

Firstly: Import data



Then: Organise the pile of data



What happens when you drag the 'Mag' attribute to the Map with the mouse?



Background

Before we start practising, we can look at why this is important in the first place.

An introduction to the topic can be found here for interested teachers:

https://www.teachfirst.org.uk/blog/lead-deliberate-practice-10-things-every-teacher-educator-should-know

Lead deliberate practice – '10 things every teacher educator should know'

LINK:

https://www.teachfirst.org.uk/blog/lead-deliberatepractice-10-things-every-teacher-educator-should-know