



COLORADOVIEW 2021 - 2022

AmericaViewSM
Empowering Earth Observation Education
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COLORADOVIEW 2021 - 2022 ACTIVITIES

Evapotranspiration (ET) is a measurement of total water moved from the land surface to the atmosphere. As such, ET may serve as an indicator of the ecosystem's health, hydrologic cycle, agricultural processes, and water dynamics in the area of interest. In Colorado, the ET measurements can be used for vegetation health and drought indices as well as irrigation schedules and agriculture planning.

In GY21, ColoradoView continued the HIA on the ET retrieval and its pattern analysis with this year's focus on the spatial pattern of ET in Colorado. ColoradoView scientists and a student intern contribute to the work. The USGS Landsat Analysis Ready Data (ARD) ET dataset between 2000 and 2018 was utilized in the work. The results showed that the agriculture land has the highest ET values in the easily identifiable crop circles throughout the eastern region of Colorado. In the urbanized areas the lowest ET values are seen due to manmade landcover like asphalt streets, concrete and building roofs. The eastern grasslands return ET values greater than the western mountainous regions in the spring and summer months. The mountains are mostly masked during fall, winter, and early spring due to snow cover. There is clear difference in ET values from the southwestern counties to the northwestern counties due to multiple factors like weather patterns, land cover types and climate change.

```
Upload_ARD_ET_maps.ipynb
File Edit View Insert Runtime Tools Help

+ Code + Text

# preprocess downloaded ARD tiles
def extract_target_layers(self,
                        datafolder,
                        cur_et_FSN,
                        output_folder,
                        ExcludeLayers=['etou', 'pctum']):

    exclude_args_arr = []
    for i in ExcludeLayers:
        exclude_args_arr.append('--exclude=' + i)
    #print(exclude_args_arr)

    #output_folder = os.path.join(datafolder, 'RawTIF')
    #print(output_folder)

    # create the output folder if it doesn't exist
    # implemented outside
    # mkdir -p /drive/MyDrive/ColoradoView/ARD_ET/temp/RawTIF
    # stdout_err_fp = subprocess.check_output(
    #     ['mkdir', '-p', output_folder])

    # extract relevant list layers
    # !tar -xvf /drive/MyDrive/ColoradoView/ARD_ET/Temp/C080303210308111
    # c /drive/MyDrive/ColoradoView/ARD_ET/temp/RawTIF
    # --exclude="*.png.tif" --exclude="*.pctum.tif"
    cmd_str_pieces = ['tar', '-xvf',
                    os.path.join(datafolder, cur_et_FSN),
                    '-C',
                    output_folder,
                    ]
    cmd_str_pieces.extend(exclude_args_arr)
    print(cmd_str_pieces)

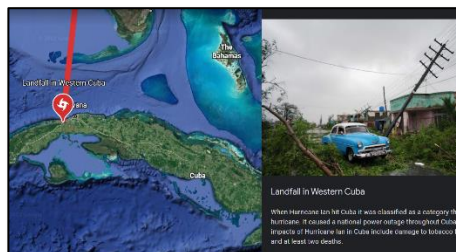
    stdout = subprocess.check_output(
        cmd_str_pieces,
        # stdout buffering
    )
    extracted_FSNs = stdout.decode('utf-8').split(sep='\n')
    return extracted_FSNs
```

Screenshot of a Google Colab notebook for extracting the Evapotranspiration (ET) and quality assurance layers from USGS Landsat Analysis Ready Data.

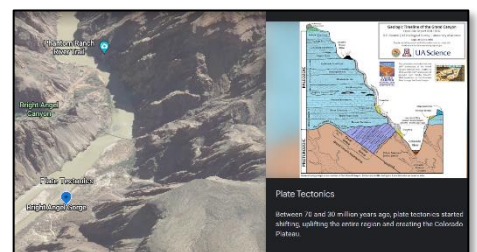


The 2022 AmericaView Annual Meeting hosted by ColoradoView at Colorado State University. The meeting strengthened collaborative work on AmericaView initiatives and promoted the exchange of remote sensing expertise on research, education, and outreach. An Outstanding Service Award was given to Rita Deike in recognition and acknowledgement of her support to AmericaView and furthering earth observation education.

Another student intern project explored the wildfire impacts on solar UV radiation at the ground level. The student prepared the narrowband UV direct and diffuse irradiances at 7 UVA/UVB channels provided by the USDA UV-B Monitoring and Research Program, covering the complex fires occurred in 2020 and mild wildfires in 2016. As expected, a more significant reduction in direct irradiance was found in the 2020 wildfires especially in the lower UV wavelengths. The contribution of diffuse (scattered) irradiance to the total was higher during the day with wildfires compared with the smoke-free days.



Screenshot of student's (Layna Webb) Google Earth Project on the Hurricane Ian.



Screenshot of student's (Margaret Thompson) Google Earth Project on the Grand Canyon tour.

ColoradoView is a member of the AmericaView Consortium, a nationally coordinated network of academic, agency, non-profit, and industry partners and cooperators that share the vision of promoting and supporting the use of remote sensing data and technology within each state. AmericaView is funded by USGS grant agreement G18AP00077.

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BENEFITS TO COLORADO

- Provided the student interns the opportunity to engage in real research projects, through which they learned
 - processing of Remote Sensing imagery using Google Earth Engine scripts;
 - programming in a team environment;
 - statistical techniques; and
 - how to write summary reports / present findings for scientific investigations.
- Analyzed temporal and spatial patterns of ET in Colorado, providing researchers, policy makers, and stakeholders with the water stress condition in Colorado for the past two decades.
- The observed relative increase of the diffuse solar irradiance across the UVA/UVB spectrum during the wildfires may contribute to the increased formation of ozone and decreased air quality in Colorado.
- Promoted Remote Sensing (RS) education through lectures (Physical Geography) at Colorado State University. The lecture includes several projects. The project on Google Earth teaches students a powerful way to present stories on any topic that involves geophysical elements including RS images. The project on assembling a weather station allows student to review and understand what they learned about weather, climate, solar energy, etc. and to see their measurements' real-world impact – improving weather forecast accuracy specific to their local areas.



Student intern Joey Paulson presented the wildfire/smoke UV effects at a SPIE conference.



ColoradoView scientist Maosi Chen gave a lecture on Google Earth at Colorado State University.

COLORADOVIEW CONSORTIUM MEMBERSHIP



Federal consortium members identified above do not receive funding from AmericaView.

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