Forest Fires

-She Space International Project-

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Topic

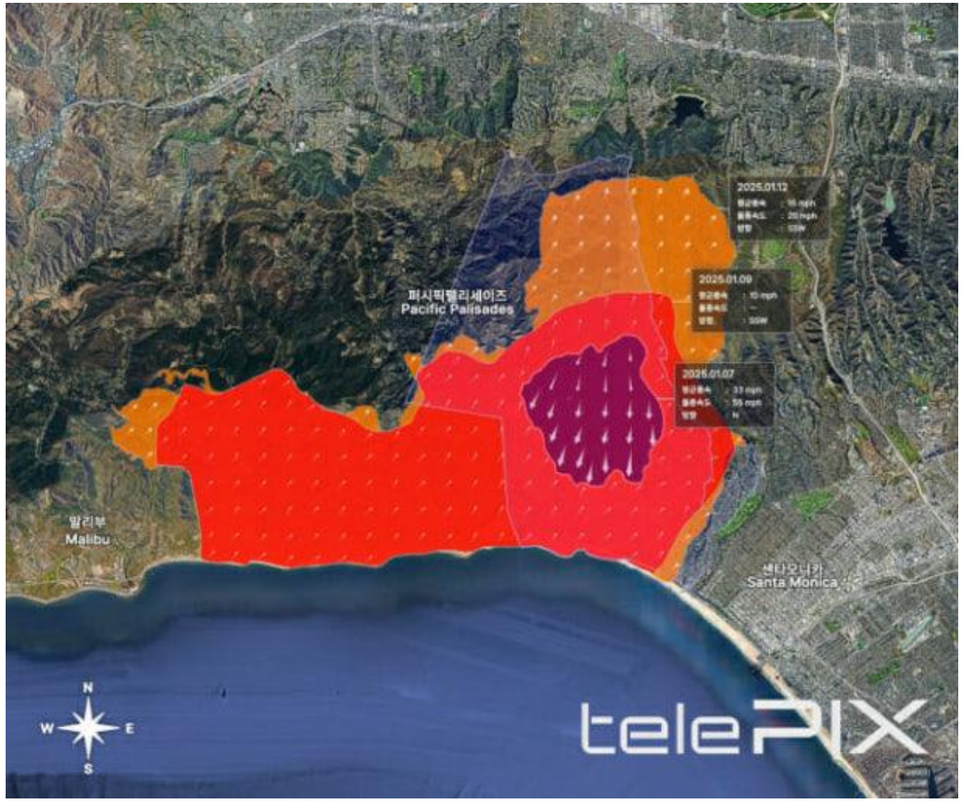
NDVI-Based Analysis of Vegetation Changes Following Forest Fires

Topic Selection Background

01 Global forest fire

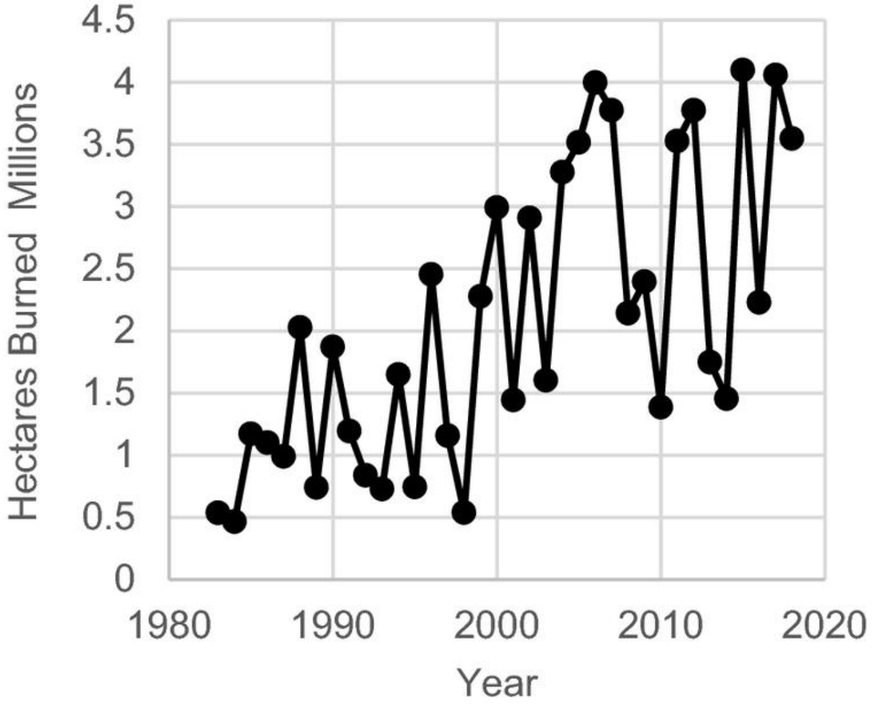
02 2025 Uiseong Forest Fire in South Korea

02 Global forest fire

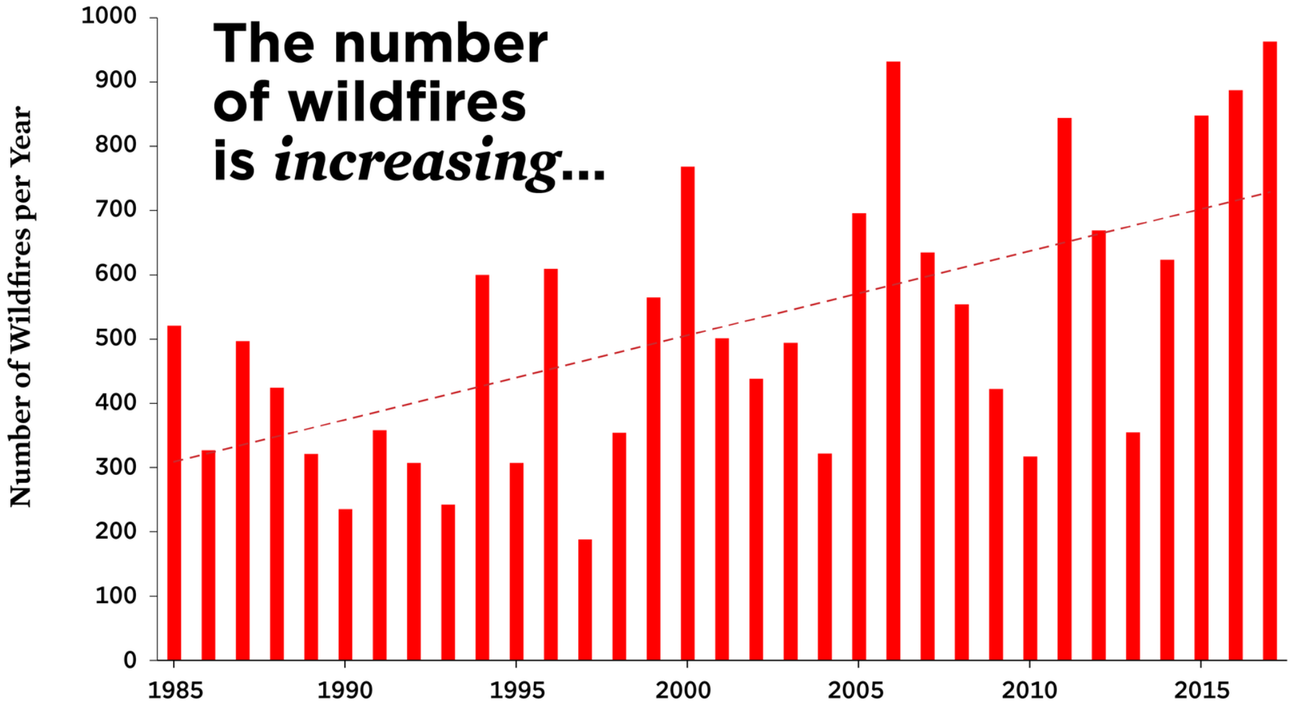


Country	Year of occurrence	Damaged area (km^2)
Australia	2020	240000
LA	2025	231
Hawaii	2023	8.8

02 Global forest fire



(a) Burned areas due to wildfires



02 2025 Uiseong wildfire in Korea

- 2025.03.22 ~ 2025.03.30
- Damaged area: 48150 hectares
  80% of the size of Korea's capital

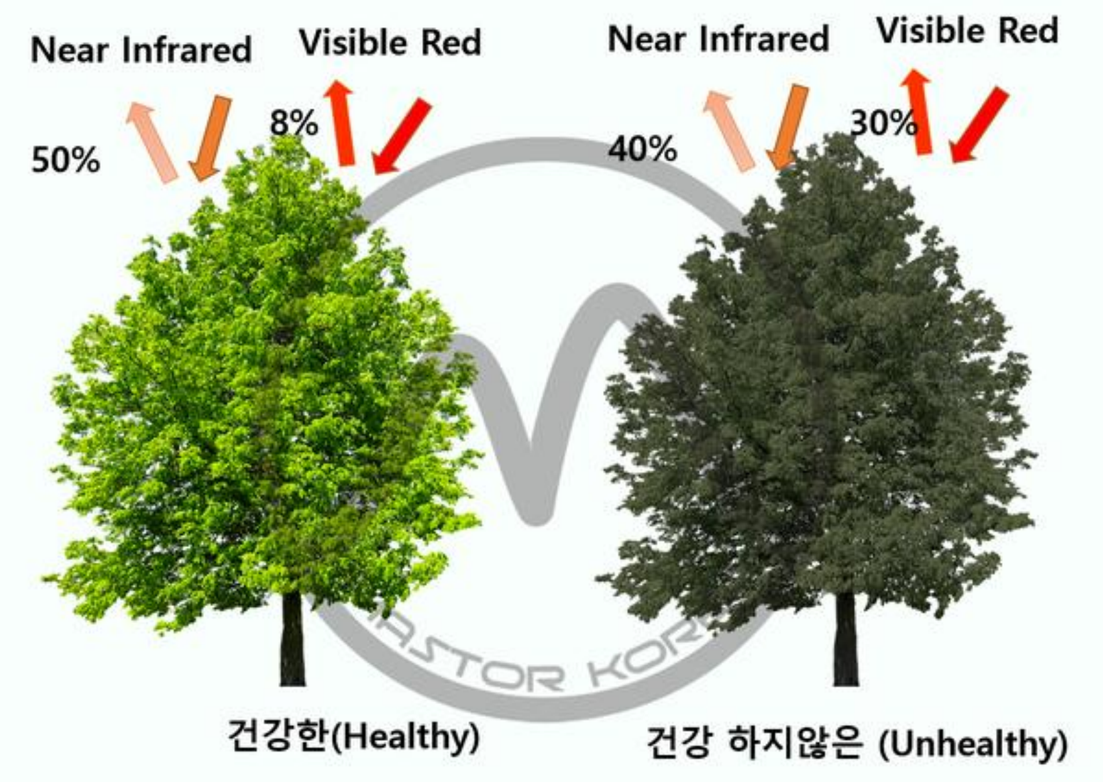
03

What is NDVI?

Normalized Difference Vegetation Index

- Indicator that measures the health status and density of plants using remote exploration technology

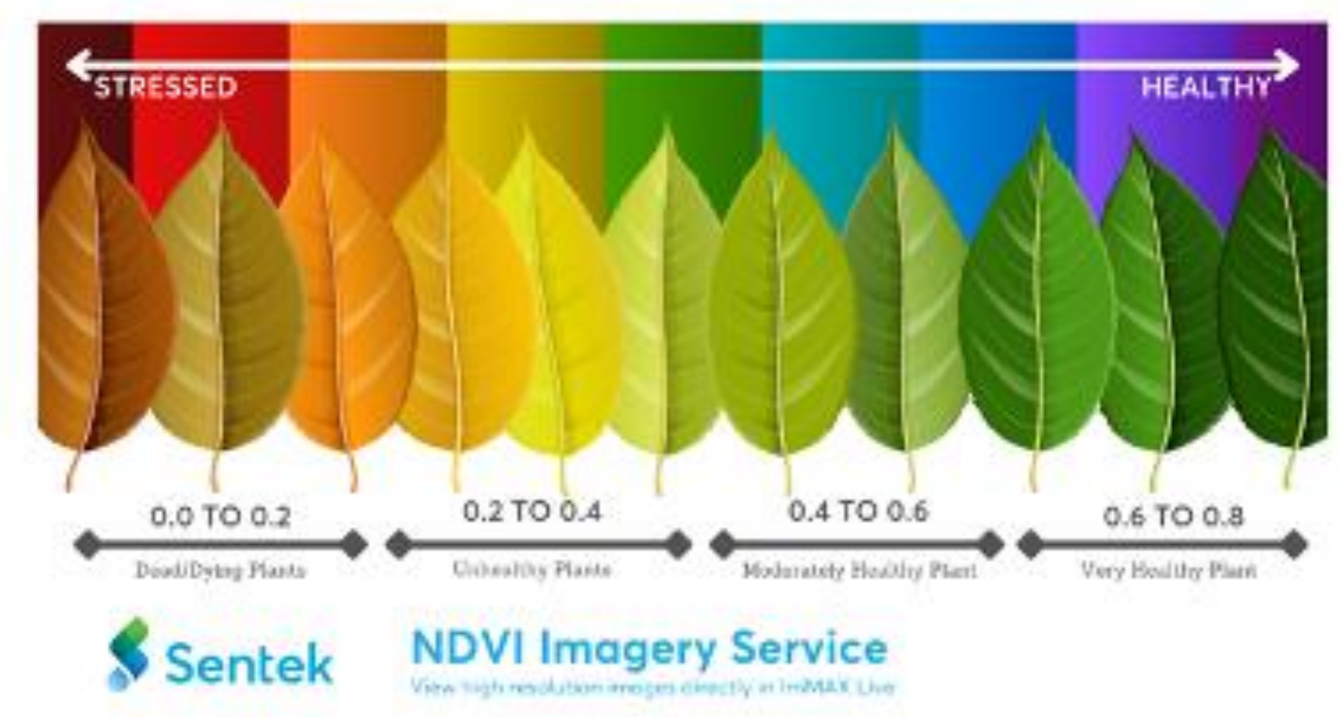
- This index is obtained by calculating the reflectance difference between the red wavelength and the near-infrared wavelength.



03

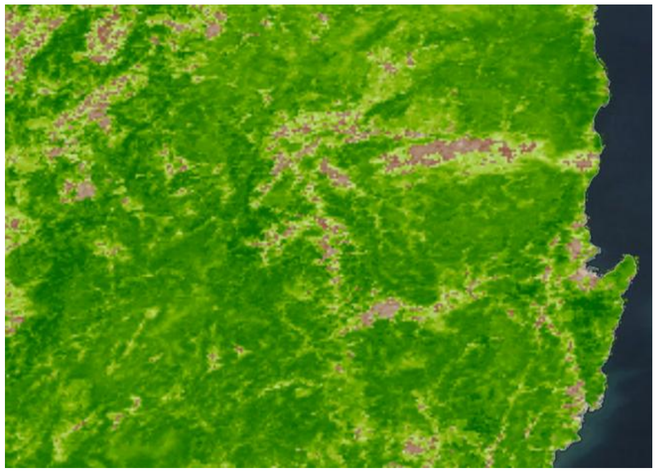
What is NDVI?

Normalized Difference Vegetation Index

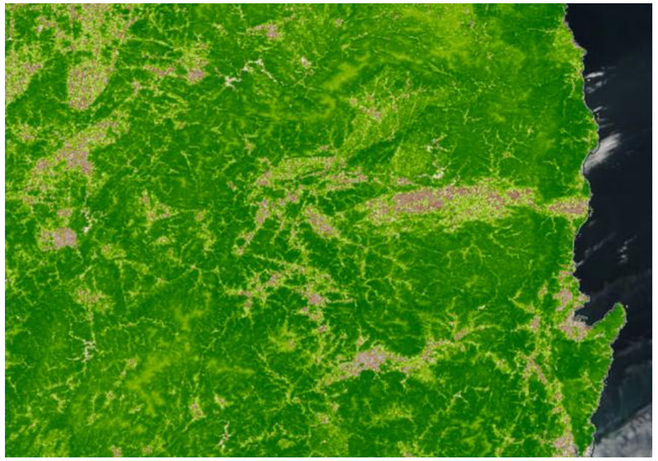


Comparison before and after forest fires based on NDVI data

terra



aqua

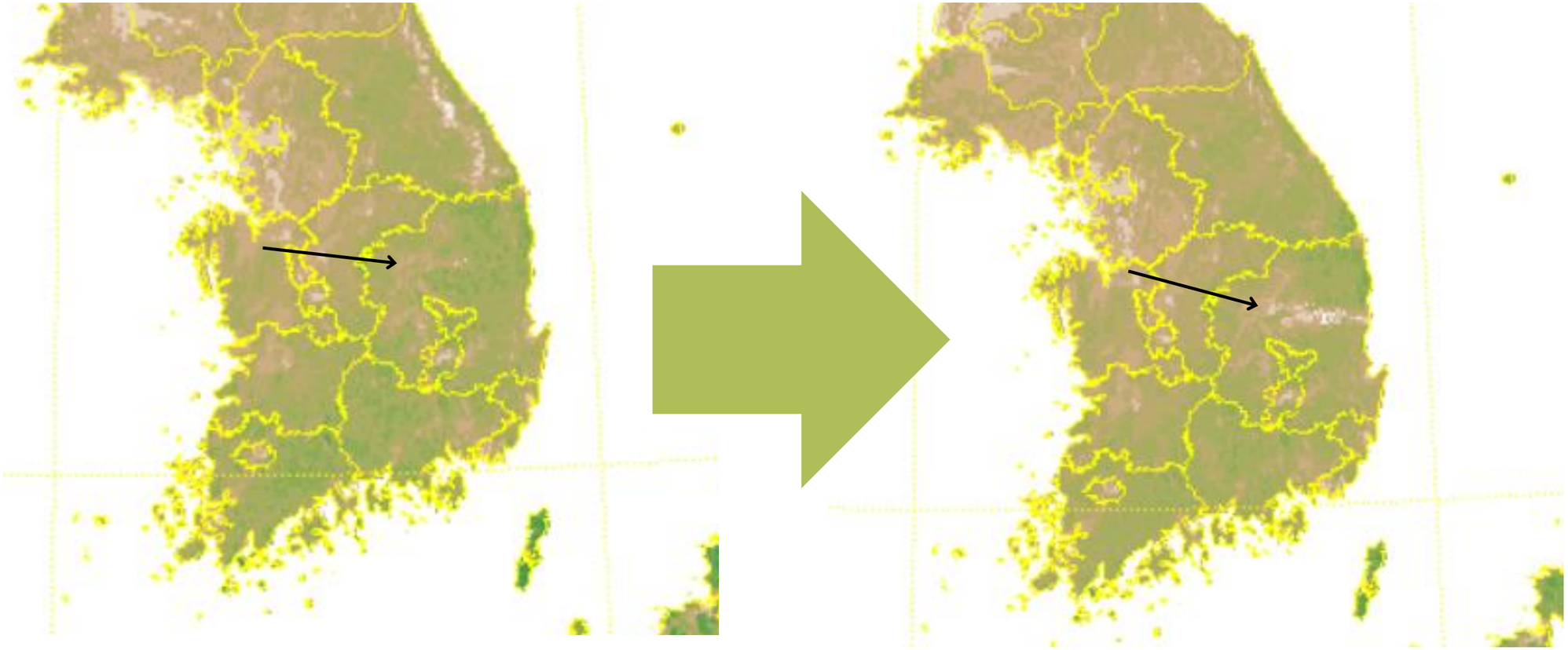


Before the forest fire- March

After the forest fire- April

GK2A

Comparison before and after Uiseong forest fires based on NDVI data



Before forest fire

3/15

After forest fire

3/30

Research methods

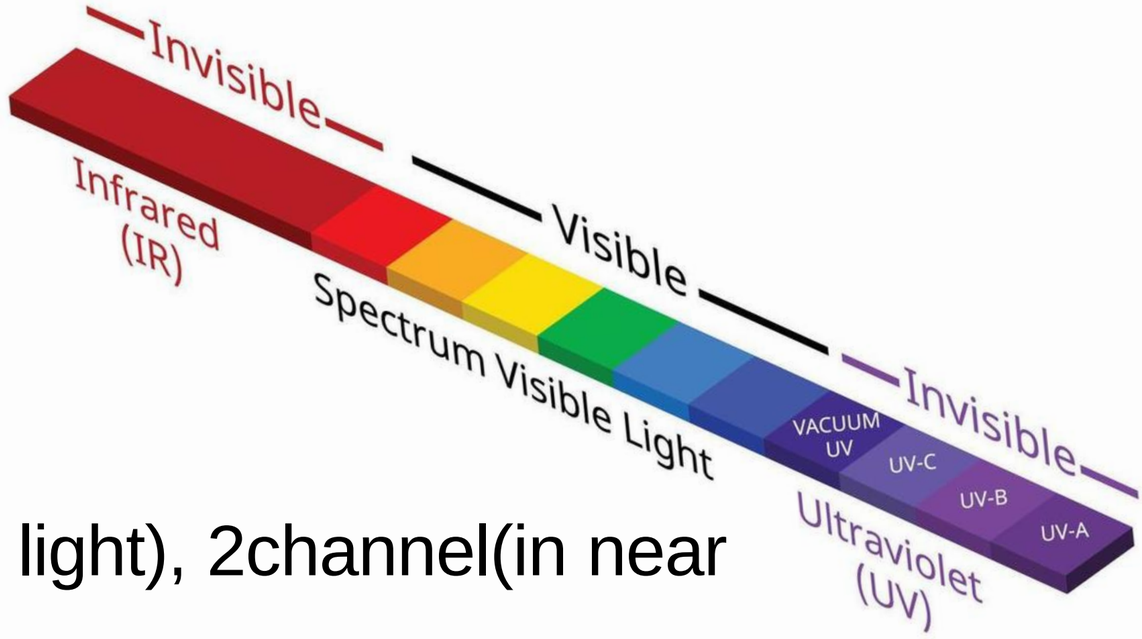
1. GK2A

2. Colab

Research methods
- data collection methods

GK2A

1. Official operation
   - 2019. 7. 25
2. Resolution
   - Spatial resolution: 4 channel(in visible light), 2channel(in near infrared), 10 channel(in infrared)
   - Time resolution: 10minute(Earth), 2minute(Korea, Asia-Pacific)



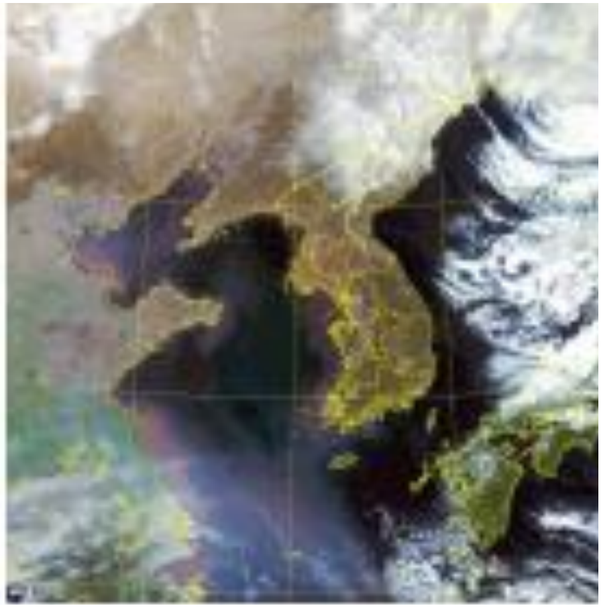
GK2A

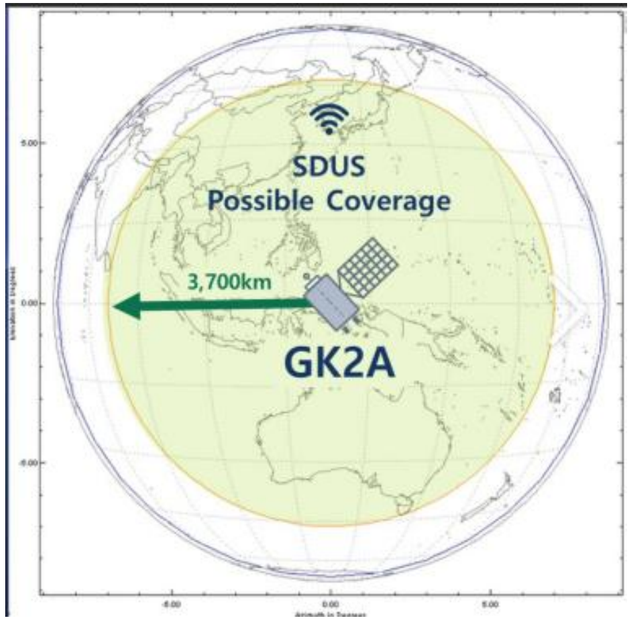
- Can observe the earth every 10 minutes

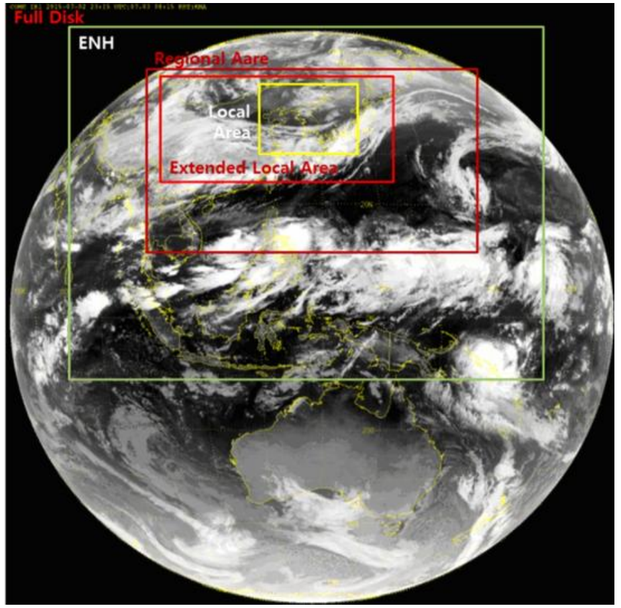
> enable more rapid monitoring and preparation for various disasters

> damage over time can be successively observed

- AMI(Advanced Metering Infrastructure) mounted on GK2A







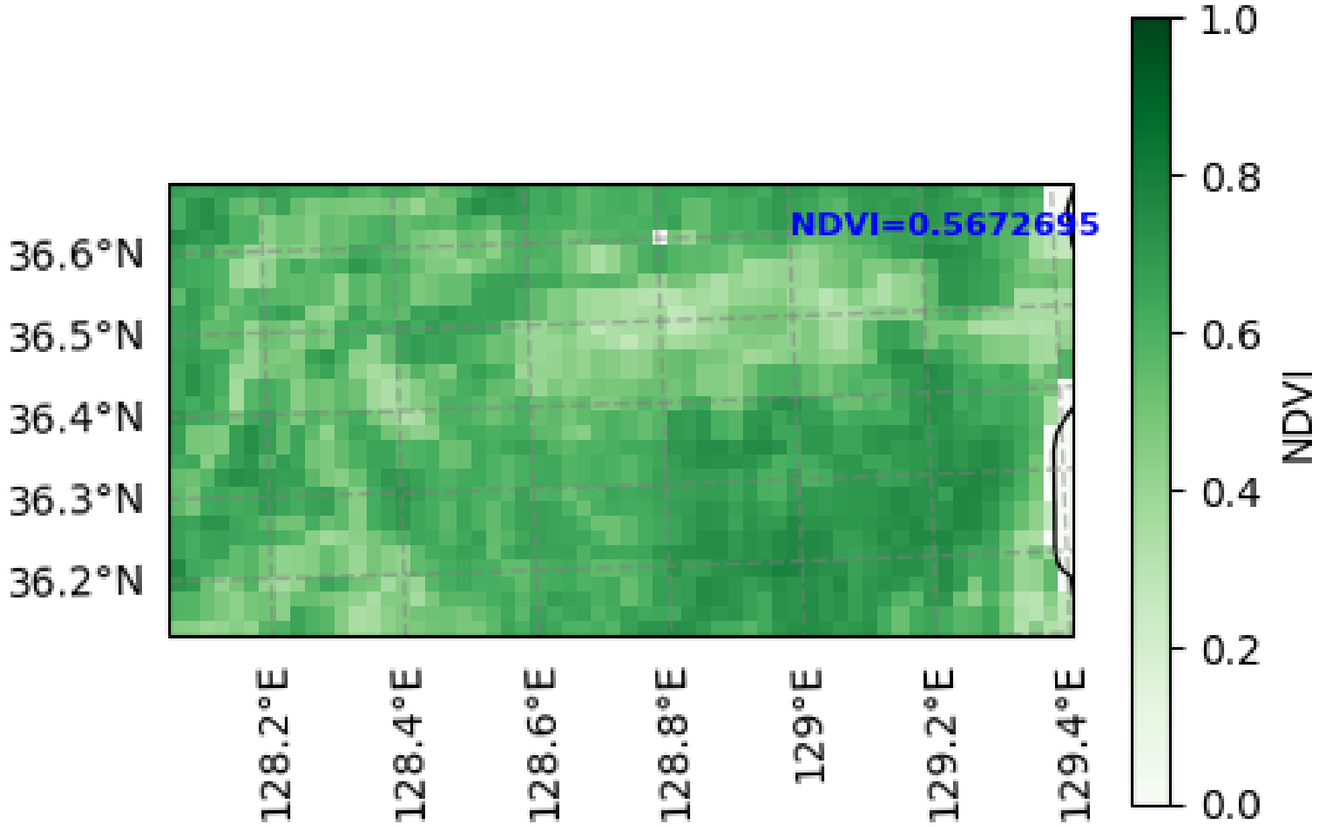
Bands		Center Wavelength		Band Width (Max, um)	Resolution (km)
		Min(um)	Max(um)		
VNIR	VIS0.4	0.431	0.479	0.075	1
	VIS0.5	0.5025	0.5175	0.0625	1
	VIS0.6	0.625	0.66	0.125	0.5
	VIS0.8	0.8495	0.8705	0.0875	1
	NIR1.3	1.373	1.383	0.03	2
	NIR1.6	1.601	1.619	0.075	2
	NIR2.2				2
MWIR	IR3.8	3.74	3.96	0.5	2
	IR6.3	6.061	6.425	1.038	2
	IR6.9	6.89	7.01	0.5	2
	IR7.3	7.258	7.433	0.688	2
	IR8.7	8.44	8.76	0.5	2
LWIR	IR9.6	9.543	9.717	0.475	2
	IR10.5	10.25	10.61	0.875	2
	IR11.2	11.08	11.32	1.0	2
	IR12.3	12.15	12.45	1.25	2
	IR13.3	13.21	13.39	0.75	2

VIS0.6 (red reflectance) and VIS0.8 (near-infrared reflectance) are used for NDVI

Coding with CoLab

1. Download NDVI data where you want to investigate
2. Load the Korean Peninsula latitude grid data and load the NDVI data of GK2A on top of it
3. Cut the data by specifying the area you want to investigate
4. Weave code to visualize NDVI data
5. Load data visualizing NDVI

Coding with CoLab



Research subject: 2022 Uljin Forest Fire

2022.03.04
~ 2022.03.13

For the 2022-2025 period
- NDVI observation

Tasks

1. NDVI Observeable Wildfires Selection → 2. NDVI collection at selected point → 3. Comparison of NDVI changes before and after wildfires → 4. Create a NDVI change graph using the sheet → 5. Make conclusion

1.NDVI Observeable Wildfires Selection

Selection criteria

- Wildfires that occurred when GK2A is available (after July 25, 2019)
- Wildfires with observable NDVI values

Candidate1: 2019 East Coast Wildfires in Gangwon-do

- Before the observation date -> eliminated

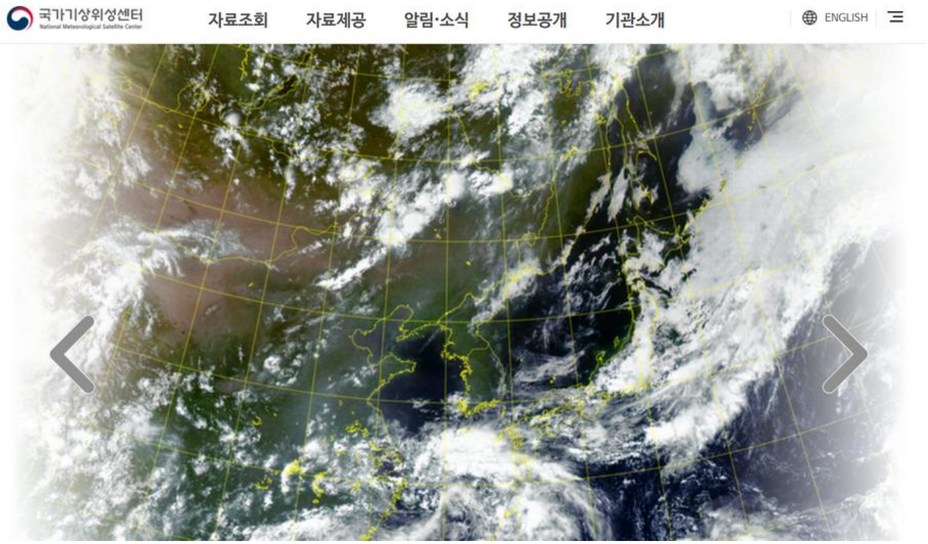
Candidate 2: 2020 Andong Wildfire

- No change observed -> eliminated

Candidate 3: 2022 Uljin-Samchuk Wildfire

- Selected

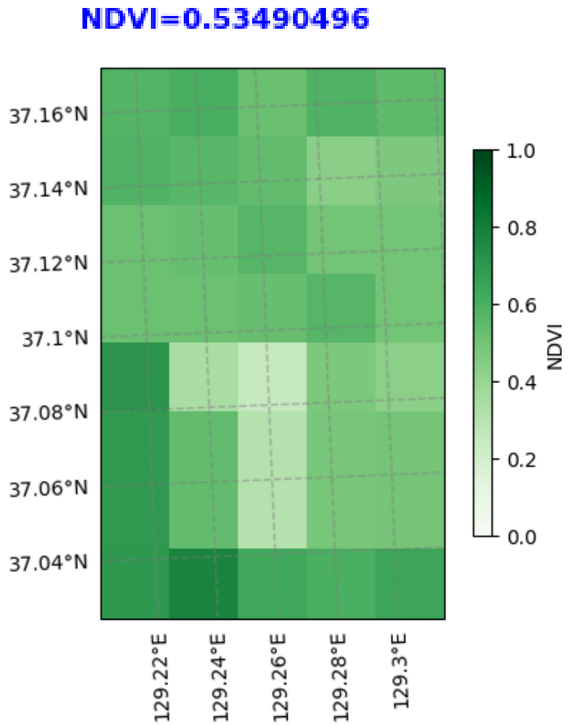
2. Collection of NDVI data at selected points



1. Gather NDVI data of GK2A
   - Meteorological Agency data
   - 2021-2025 level2 NDVI data collection
   - Select of materials on the 1st of every month
2. Open data through colab
   - Gather the average value of NDVI by specifying the latitude and enlarging it

 -> Latitude: 37.0 to 37.15 Longtitude: 128.2 to 129.3

3. Comparison of NDVI changes before and after wildfires



	2021	2022	2023	2024	2025
1월		0.60478103	0.537811	0.55179	0.59726
2월		0.583668	0.48902297	0.45605	0.33847398
3월	0.331665	0.531926	0.53078604	0.269898	
4월	0.46761197	0.533126	0.46489102	0.457928	
5월	0.511434	0.5465909	0.602536	0.62243795	
6월	0.842573	0.790735	0.8041891	0.78609293	
7월	0.7274029	0.85982996	0.77899694	0.8059069	
8월	0.7897419	0.73341095	0.7743249	0.80519193	
9월	0.879843	0.84550595	0.7852521	0.80626893	
10월	0.843728	0.83880395	0.8004599	0.78637904	
11월	0.65960497	0.562929	0.569247	0.648772	
12월	0.602427	0.5846369	0.595612	0.508189	

Check for trends of NDVI change after manually creating a table of the average NDVI values for the region obtained through colab.

3. Comparison of NDVI changes before and after wildfires

	2021	2022	2023	2024	2025
1월		0.60478103	0.537811	0.55179	0.59726
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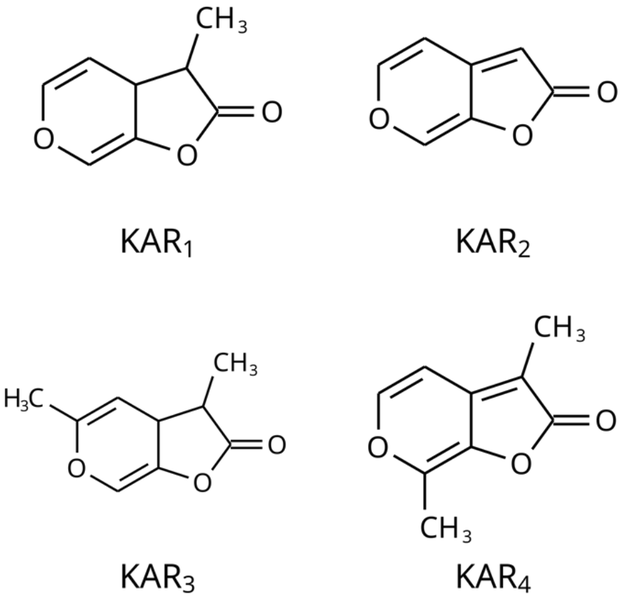
3. Comparison of NDVI changes before and after wildfires

*** Growth of herbaceous vegetation**

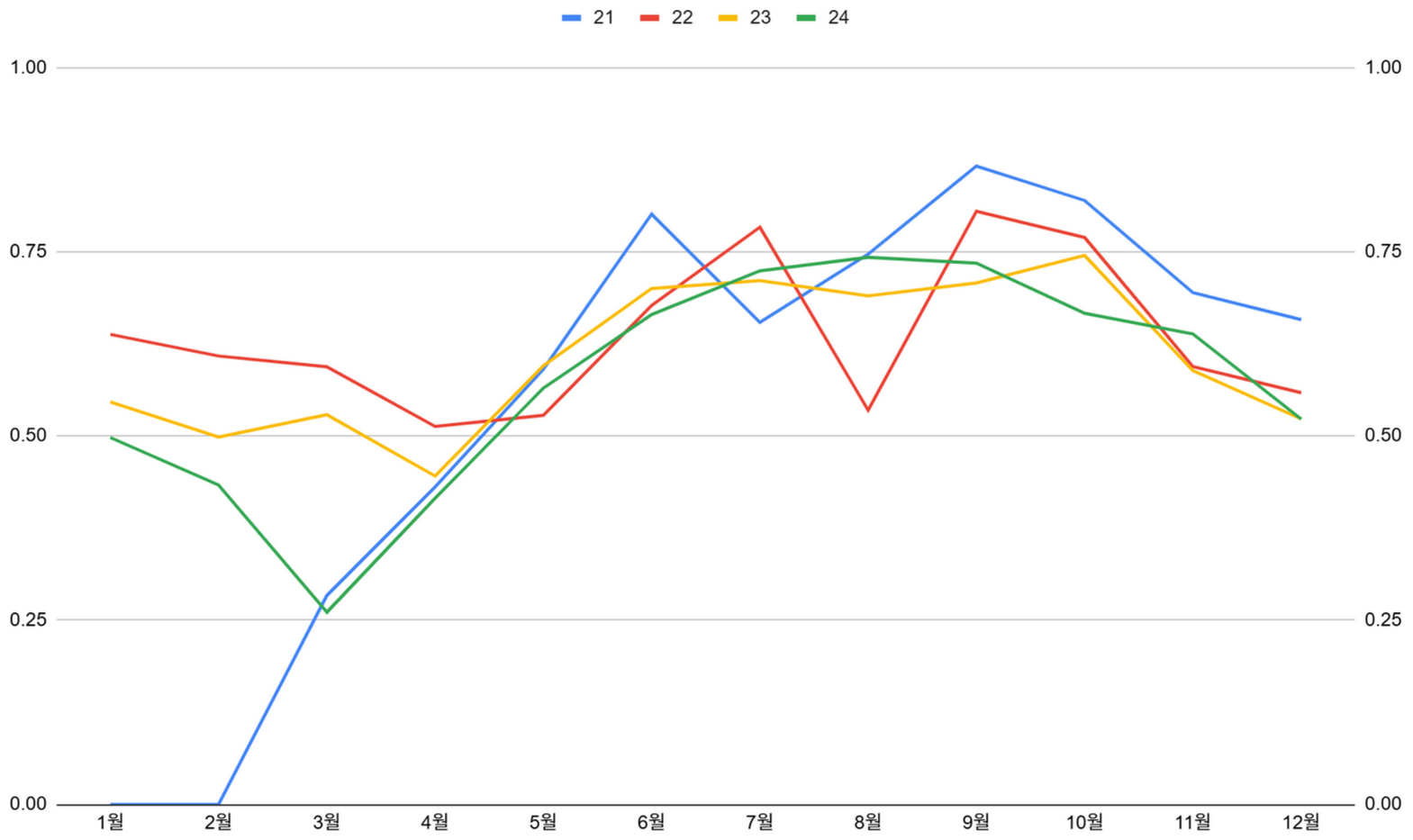
- Low-growing grass and shrub
- level plant communities
- Vegetation that typically has a short life cycle
- High growth rate and large leaf area



: A greening burst during the early regeneration stage

: NDVI measured highly in herbaceous vegetation environments without forest.

4. Create a NDVI change graph using the sheet



It is necessary to consider the error caused by the weather (clouds) at the time of measurement.

5. Make conclusion

Does the NDVI decrease after the wildfire?

-> In the short term, there is an increasing trend for two months, but in the long term, there is a decreasing trend.

reason 1) Herbaceous Vegetation(Bush)

After a wildfire, small plants can grow quickly and make NDVI rise fast.

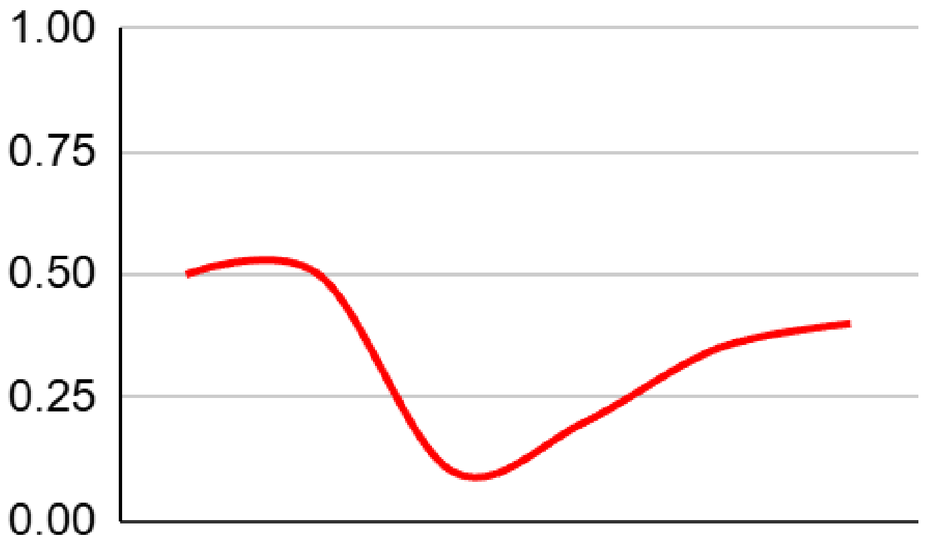
reason 2) Karrikin

Smoke contains a chemical called karrikin that helps seeds start to grow. This speeds up the recovery of vegetation.

Expectation

-Sharp drop right after the fire

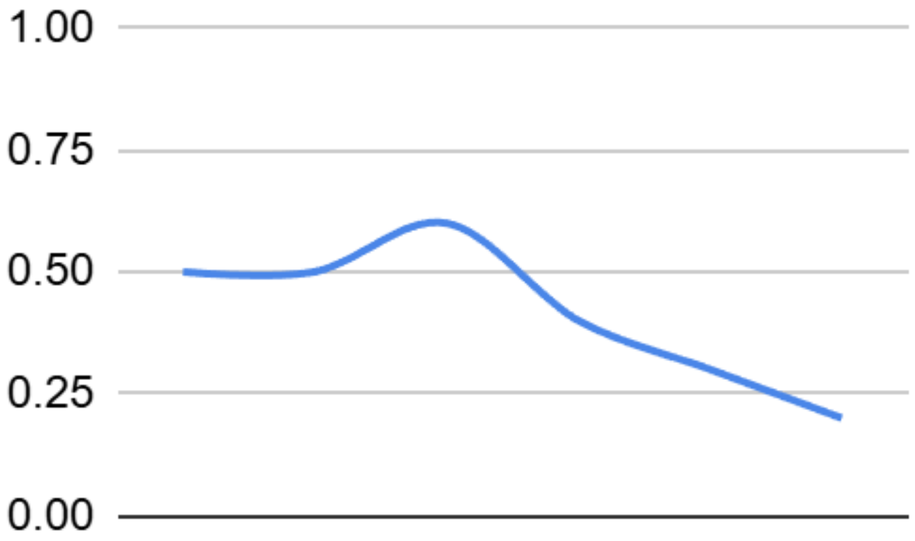
-Gradual recovery



Actual

-Slight increase after the fire

-Gradual decline



Impressions and reviews

Open Access Article

Detecting Vegetation Recovery after Fire in A Fire-Frequented Habitat Using Normalized Difference Vegetation Index (NDVI)

by **Danielle L. Lacouture** [1], **Eben N. Broadbent** [2] and **Raelene M. Crandall** [1,*]

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[2] Spatial Ecology and Conservation Lab, School of Forest Resources and Conservation, University of Florida, Gainesville, FL 32611, USA

* Author to whom correspondence should be addressed.

```
#GK2A NDVI 데이터 로드
data_path = '/content/drive/MyDrive/Colab Notebooks/GK2A/gk2a_ami_le2_vgt_ko020lc_202103010000.nc'

file1 = nc.Dataset(data_path, 'r')
ndvi = file1.variables['NDVI']

date = data_path.split('_')[-1].split('.')[0]
date
```

```
'202103010000'
```

```
#NDVI 정의
#NDVI (Normalised Difference Vegetation Index) = (NIR - Red) / (NIR + Red)
```

Thank you!