BIODIVERSITY BUILDING BLOCKS FOR POLICY

Empowering Biodiversity Monitoring through Data Cubes

Techniques & Applications for Open Science

Maarten Trekels & Sandra MacFadyen

Funded by the European Union

Meise Botanic Garden

NITheCS
National Institute for Theoretical and Computational Sciences

Stellenbosch UNIVERSITY IYUNIVESITHI UNIVERSITEIT

2, 9, 16, 23 Oct 2024
Online
NITheCS mini-school

Introductions

Biodiversity Monitoring and Data Cubes

Who are we

Online: Wednesdays - 2, 9, 16 & 23 October 2024 @ 14h00-15h00 SAST

Sandra MacFadyen is a research fellow with the Mathematical Biosciences Lab at Stellenbosch University (SU). She earned a joint PhD in Botany from SU and Landscape Ecology from Vrije University Amsterdam in 2018, alongside an MSc in Geographic Information Science and postgraduate degrees in Nature Conservation. Sandra is a core member of the EU-funded Biodiversity Building Blocks for Policy programme, a NITheCS Associate, and a principal investigator in a NITheCS research programme. Based in the Kruger National Park with the SANParks Savanna Science Unit, she specialises in macroscale ecosystem dynamics and applied spatial statistics for biodiversity conservation. Through her roles at BioMath and NITheCS, she focuses on advancing novel mathematical models to tackle critical ecological challenges.

Maarten Trekels is a Biodiversity Data Scientist and project coordinator at Meise Botanic Garden, Belgium. With a background in Physics and industry experience in aerospace and medical fields, he shifted to biodiversity data through developing standards for the Biodiversity Information Standards organisation under EU-funded projects related to the DiSSCo research infrastructure. He currently coordinates a local implementation of the research infrastructure in Flanders and contributes to FAIR data strategies and interdomain interoperability as a member of the Research Data Alliance. Maarten is also a work package leader in the EU-funded Biodiversity Building Blocks for Policy programme and is pursuing a PhD at SU, focusing on community ecology.

Biodiversity Monitoring using Data Cubes

Techniques and Applications for Open Science

Mini-school Outline

Online: Wednesdays - 2, 9, 16 & 23 October 2024 @ 14h00-15h00 SAST

- **Session 1: Introduction** (Sandra and Maarten)
  - A general introduction to **Biodiversity** and **Data Cubes**
  - Sources of Biodiversity **Data** and **Data Standards**
  - Data **publication** and **FAIR** data publishing
  - Homework - List of free accounts to setup before next, more hands-on, sessions
- **Session 2: Building Data Cubes with GBIF** (Maarten)
  - Introduction to GBIF data
  - A Hands-On Guide for Biodiversity Monitoring
- **Session 3: Ecological Modelling with Data Cubes** (Sandra)
  - Create your own Data Cube using GBIF, Google Colab and Earth Engine
  - Visualise results on a interactive map
  - Analyse patterns of species diversity related to environmental variables, like climate
- **Session 4: Open Science** (Maarten and Sandra)
  - Sharing and Disseminating Results
  - Hands-on with *Github* and *Zenodo*
  - Mini-school Wrap Up and what would you like to see next?

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LECTURE 3: ANALYSING DATA CUBES

A practical guide - Techniques and Tools for Ecological Modelling

Sandra MacFadyen

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16 October 2024
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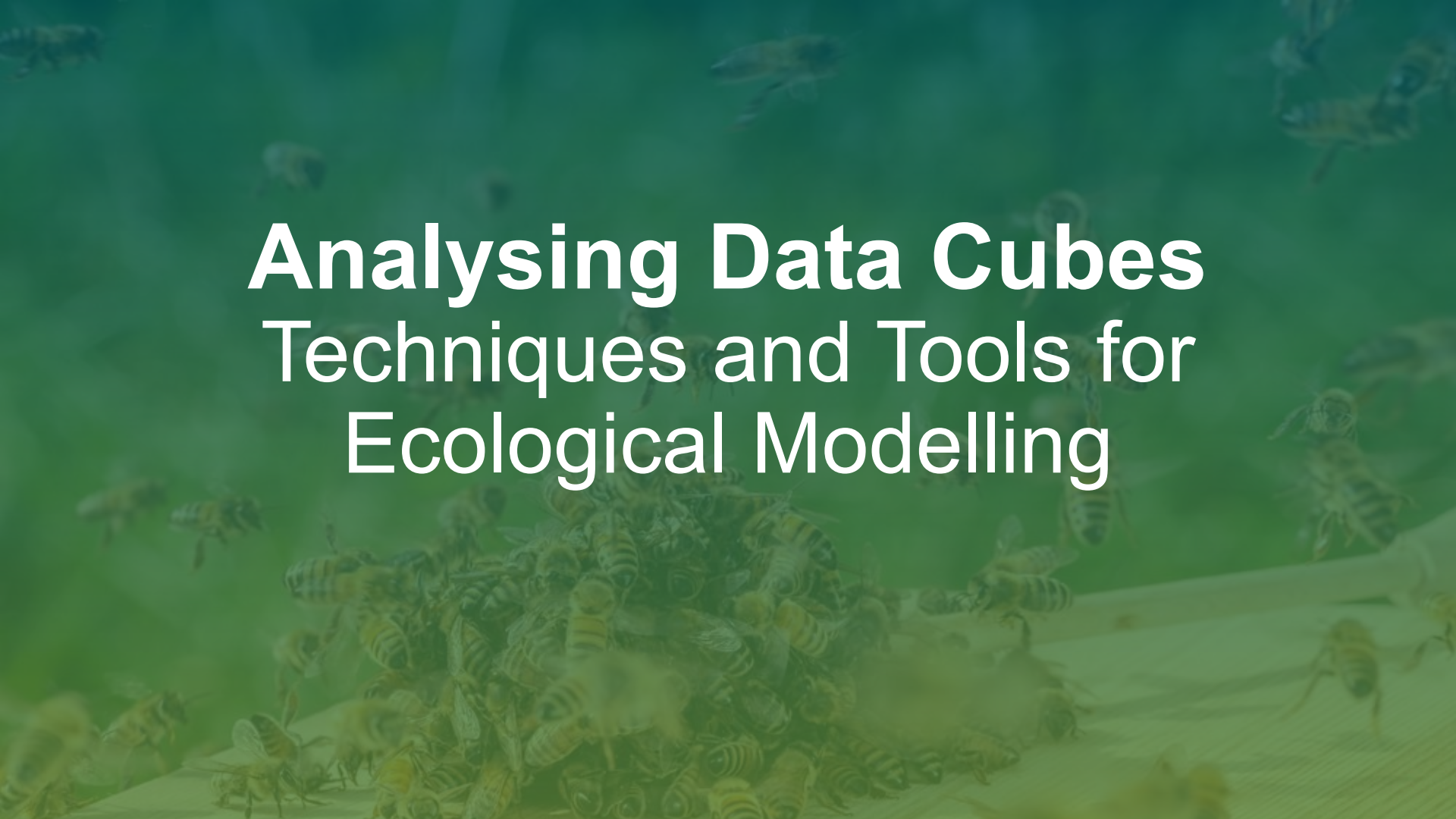
NITheCS mini-school



Analysing Data Cubes

Techniques and Tools for Ecological Modelling

Biodiversity Monitoring using Data Cubes

Techniques and Applications for Open Science

Links to today's material

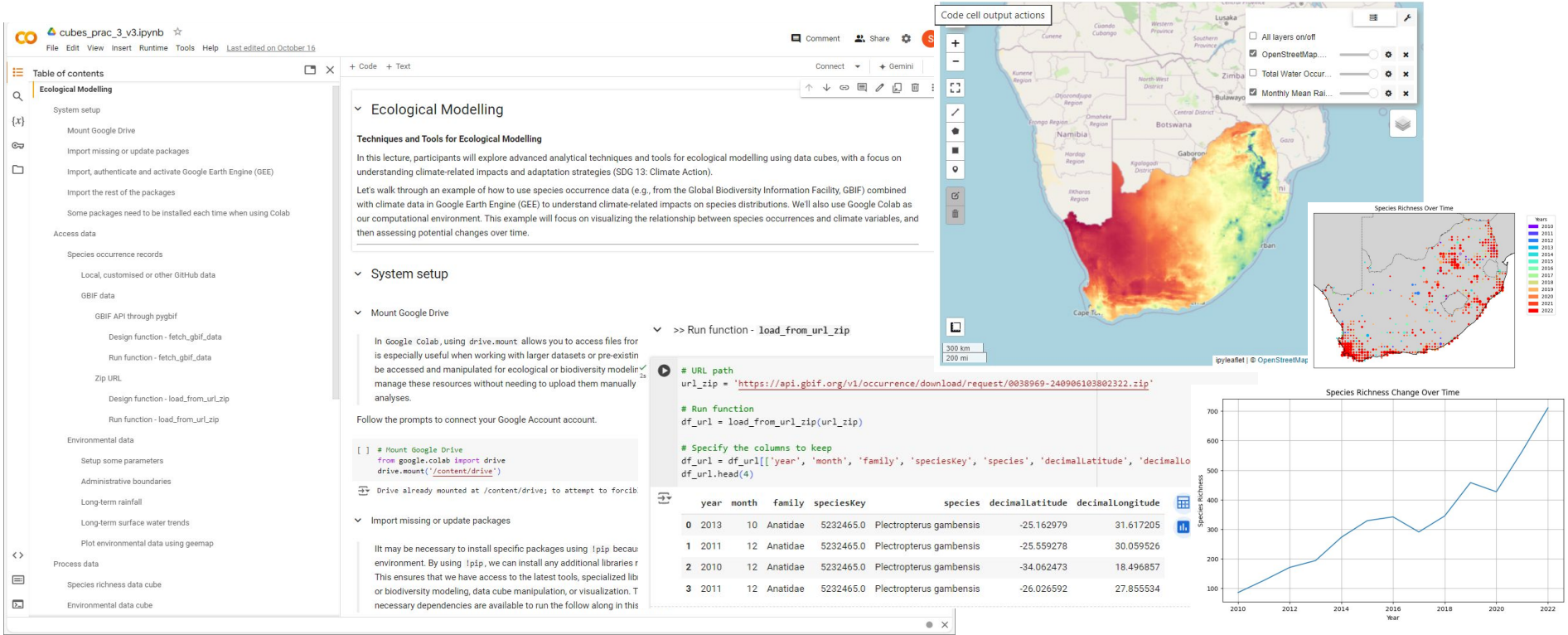
- **Colab code:**

  https://github.com/nithecs-biomath/mini-schools/blob/main/cubes_prac_3.ipynb

Biodiversity Monitoring using Data Cubes

Techniques and Applications for Open Science

Jupyter Notebook in Colab



Biodiversity Monitoring using Data Cubes

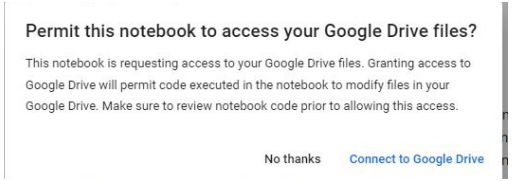
Techniques and Applications for Open Science

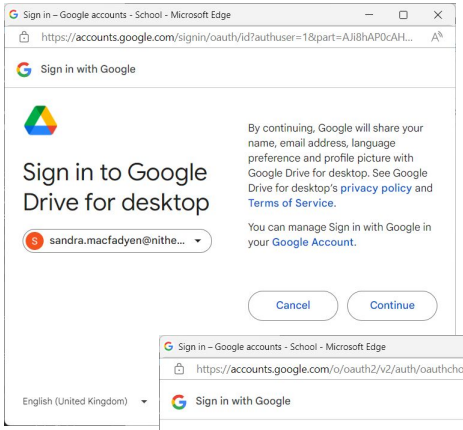
Colab - Mount GDrive

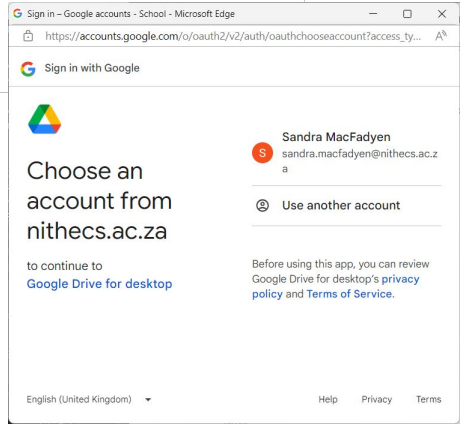
Follow the prompts to connect your Google Account account.

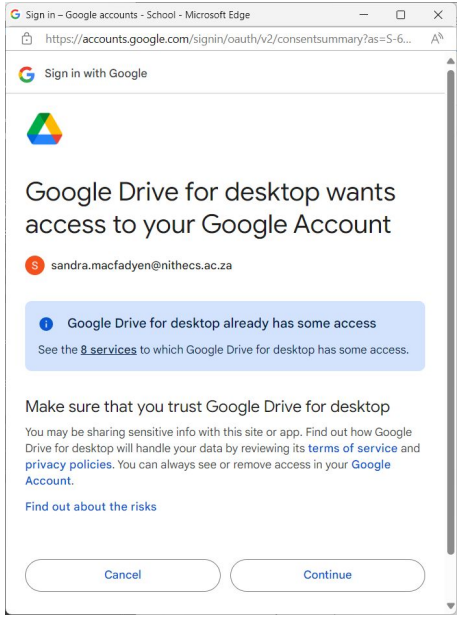
```
# Mount Google Drive
from google.colab import drive
drive.mount('/content/drive')
```

```
Mounted at /content/drive
```









Biodiversity Monitoring using Data Cubes

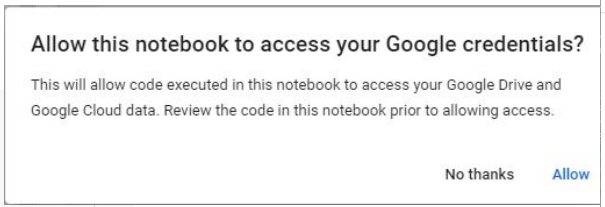
Techniques and Applications for Open Science

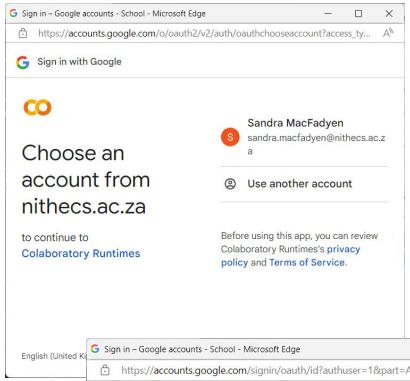
Colab - Import, Authenticate and Initialize Google Earth Engine

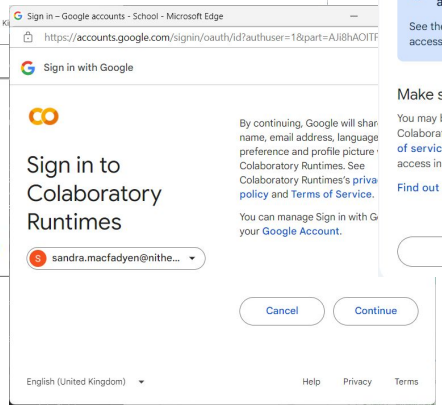
- ! The first time you do this you'll be prompted to add a 'token key'. `ee.Authenticate()` should initiate pop-up tabs with prompts to get to retrieve your unique 'token key'. Copy and paste this into the cell that will appear in your jupyter notebook !
- The next time you ee.Initialize(), the following prompts should appear:

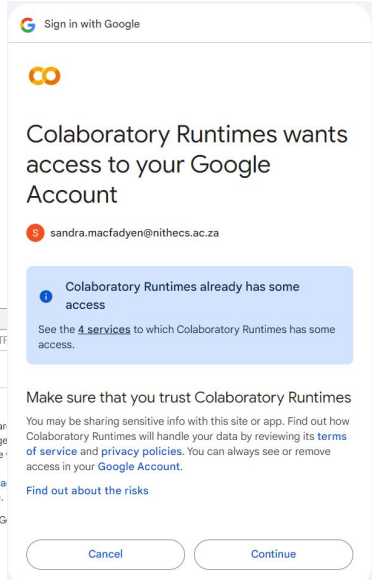
Follow the prompts to connect your GEE account.

```
[ ] # Import, authenticate and activate Earth Engine (EE)
    import ee

    # Trigger the authentication flow.
    ee.Authenticate()

    # Initialize the library.
    ee.Initialize(project='ee-biodatacube') # Change according to your own project name
```









Analysing Data Cubes

Techniques and Tools for Ecological Modelling

Questions?

END OF DAY 3

Thank you!

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