

The Tech We Want Online Summit

18th
Oct, 24



#semantic*Climate*
Transforming information into actionable knowledge

DEMO by Parijat
Bhadra

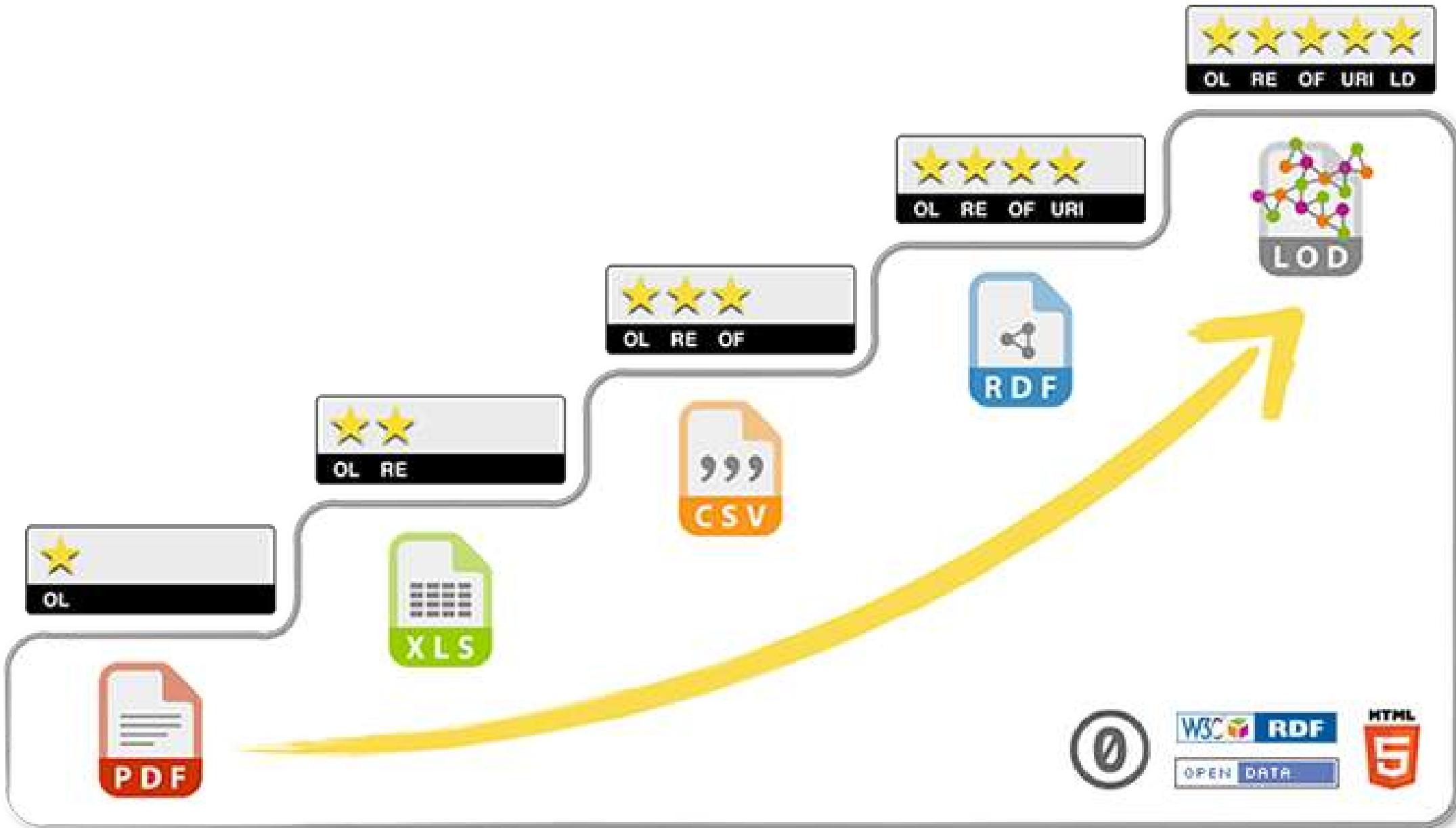
Resources :-

- amilib - <https://github.com/petermr/amilib>
- docanalysis - <https://github.com/petermr/docanalysis>
- pygetpapers - <https://github.com/petermr/pygetpapers>

DEMO LINK
[COLAB NOTEBOOK](#)

CLIMATE CHANGE





Why are we doing this ?

we believe that open climate knowledge will make contribution to solving the global climate crisis



I.1 Report and Chapter Overview

The role of the Intergovernmental Panel on Climate Change (IPCC) is to critically assess the scientific, technical and socio-economic information relevant to understanding the physical science and impacts of human-induced climate change and related extremes, including the risks, opportunities and options for adaptation and mitigation. This task is performed through a comprehensive assessment of the scientific literature. The outcomes of IPCC assessments inform the climate communication and translation of multiple sets of information to action. In addition, IPCC requires uptake of the most transparently objective, open and transparent review and decision processes to negotiate the science consensus.

Starting with the First Assessment Report (FAR; [IPCC 1990](#)) the IPCC assessments have been structured into Working Group I (WGI) assessing the physical science basis of climate change, Working Group II (WGI) assessing impacts, vulnerability, and adaptation options, and Working Group III (WGIII) assessing mitigation response options. Each report builds on the earlier comprehensive assessments by incorporating new concepts and updating previous findings. The volume of knowledge assessed and the cross-linkages between the three Working Groups have substantially increased over time.

As part of its Sixth Assessment Cycle, from 2021 to 2022, the IPCC is producing three Working Group Reports, also referred to as Special Reports, a Summary for the Non-Specialist Decision-Makers, and a Synthesis Report. The AR6 Special Reports covered the topics of Global Warming of 1.5°C ([AR6WG1](#)), Climate Change and Land ([AR6WG2](#)), and The Ocean and Cryosphere in a Changing Climate ([AR6WG3](#); [IPCC 2022](#)). The AR6 I and AR6WG2 are the first IPCC reports clearly positioned by all three Working Groups. This evolution towards a more integrated assessment reflects a broader understanding of the interconnectedness of the multiple dimensions of climate change.

I.1.1 The AR6 WGI Report

The Sixth Assessment Report (AR6) of the IPCC marks more than 20 years of global collaboration in research and endorsed, through expert assessments, one of the defining challenges of the 21st century: climate induced climate change. Since the inception of the IPCC in 1988, our understanding of the physical science basis of climate change has advanced steadily. The amount and quality of systematic observations and climate model performance metrics have continuously increased. Understanding of internal physical, chemical and biological processes has improved. Climate-related capabilities have also been enhanced, through the more systematic assessment of interactions among the components of the climate system, and improved representation of the physical processes, in line with the increasing computational capacities of the world's supercomputers.

This Report assesses both observed changes, and the components of those changes that are attributable to anthropogenic influence (i.e., human induced), distinguishing between anthropogenic and naturally forced changes (Chapter 1, Sections 1.2.1.1 and 1.1.1, and the Cross Working Group Box on Attribution). The core observational conclusions from previous IPCC reports are continued or strengthened in this Report, reflecting the robustness of the understanding of the present state and consequences of anthropogenic climate change.

The WGI contribution to AR6 is focused on physical and biogeophysical climate science information, with particular emphasis on natural climate drivers. These are informed by consensus, judgement and risk.

Semantic
document (HTML,
machine readable
and accessible)

People and Activities

DEVELOPERS

- 1.pygetpapers - Ayush Garg
- 2.amilib - Peter Murray-Rust
- 3.docanalysis - Shweata N Hegde
- 4.Jupyter notebooks - Parijat Bhadra, Renu Kumari

Presenter

Parijat Bhadra

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Simon
Worthington



Renu Kumari



Shweata N
Hegde



Parijat Bhadra

Outreach



Engaging with
highschool students,
New Delhi



Hackathon at
NIPGR, Delhi



Alumni reunion



Hackathon at
Gujarat

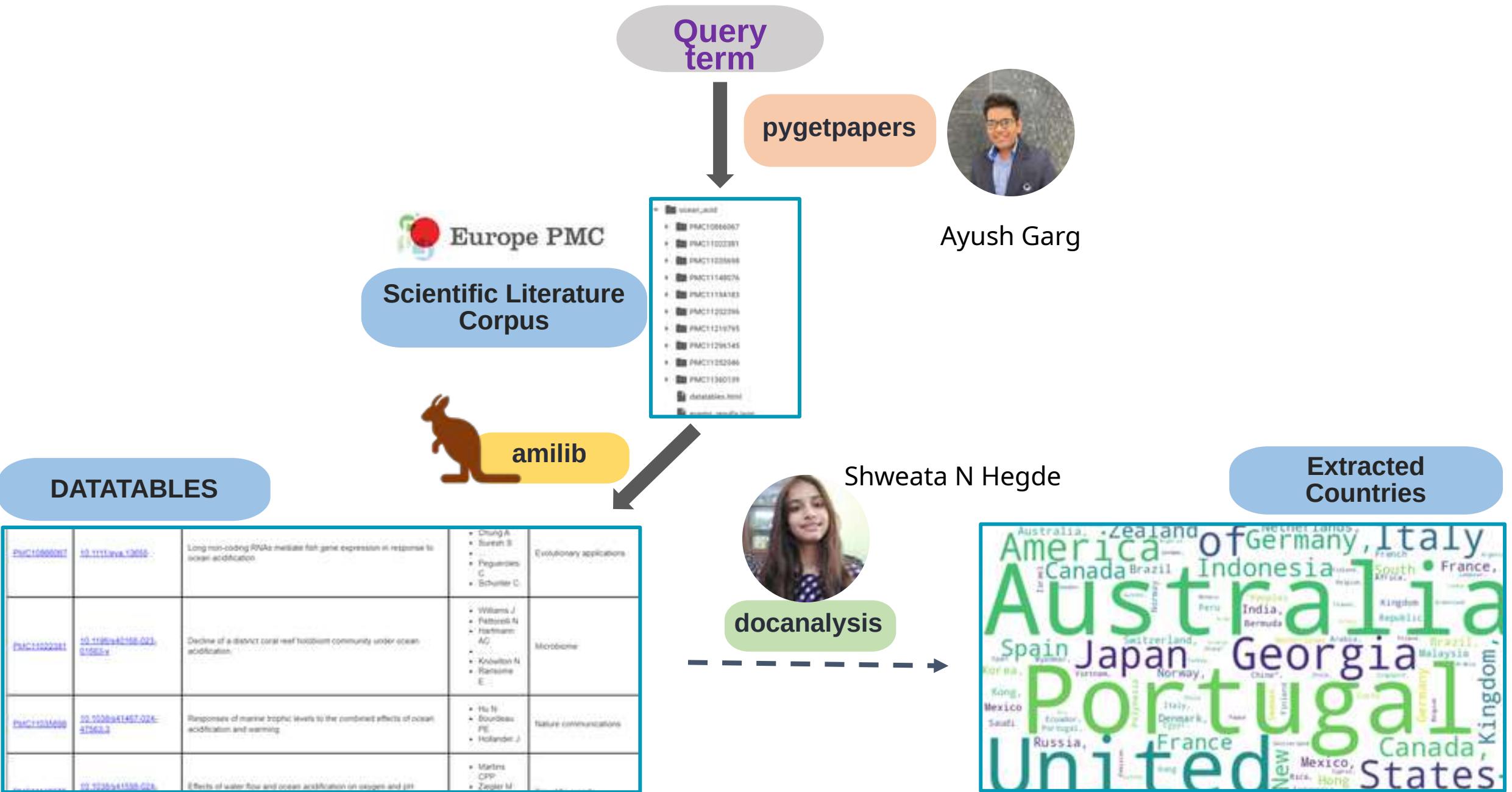
The Things We Have

Demonstrations on 24-10-18

Name	Purpose
SOFTWARE	
pygetpapers	Searching the Open Scientific Literature
amilib	Creates semantic dictionaries from words. Wikimedia lookup
docanalysis	Extracts semantic entities from documents
dictionaries	Creates semantic dictionaries from words. Wikipedia/Wiktionary Lookup
DICTIONARIES	
IPCC Glossary (DEMO)	1000+ terms/abbreviations from IPCC linked to Wikidata
CORPORA	
IPCC Chapters	Semantic content for 70+ chapters
UNFCCC Reports	"All" the COP reports for 30+ years

Contents

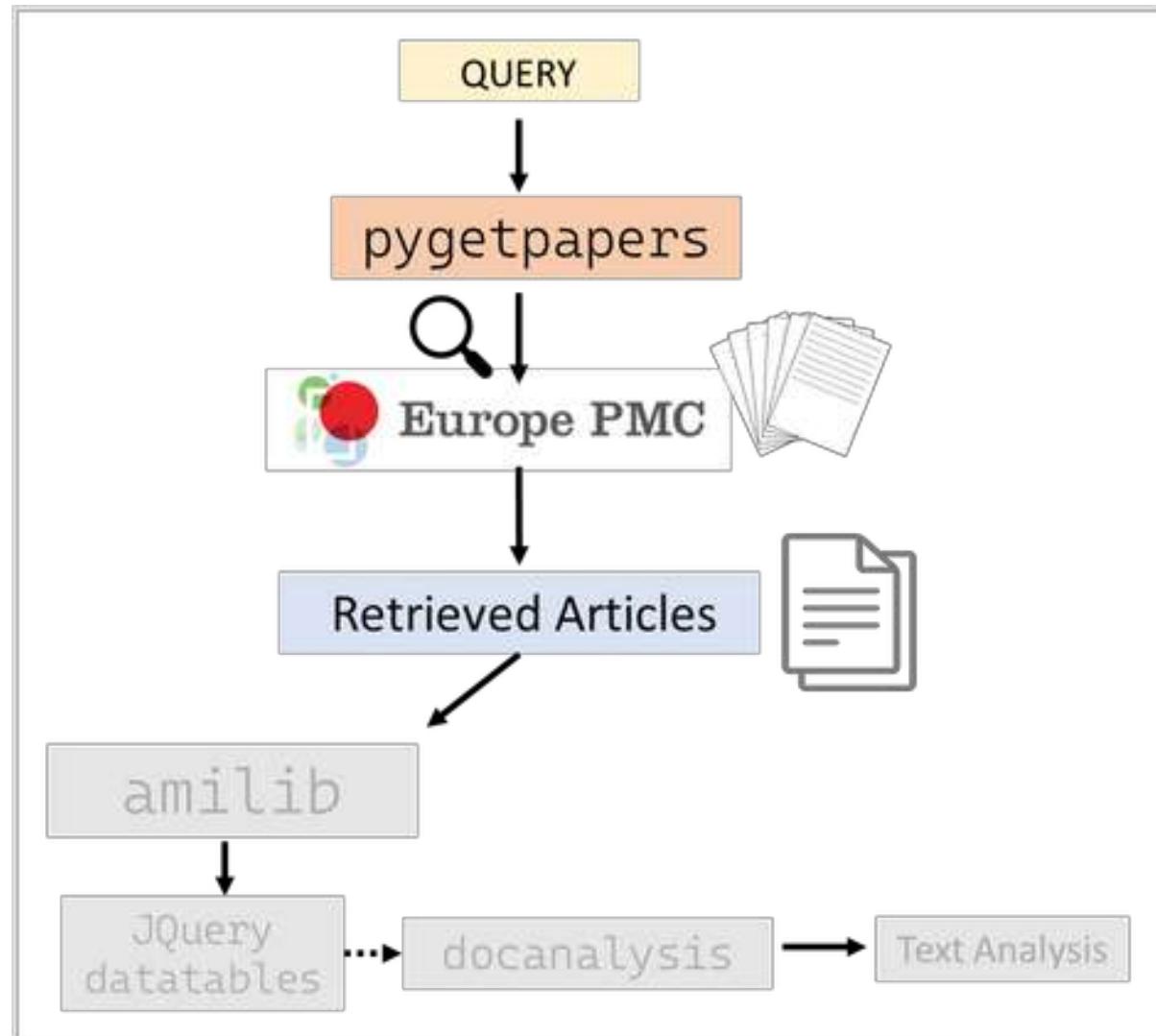
1. Installation of the tools
2. **Scientific Literature Corpus**
 - pygetpapers
 - Datatables
3. Extracting and displaying specific entities (for example COUNTRY names) with docanalysis
4. **IPCC Corpus**
 - Wikimedia enhanced Dictionary for the wordlist extracted from the IPCC corpus with amilib



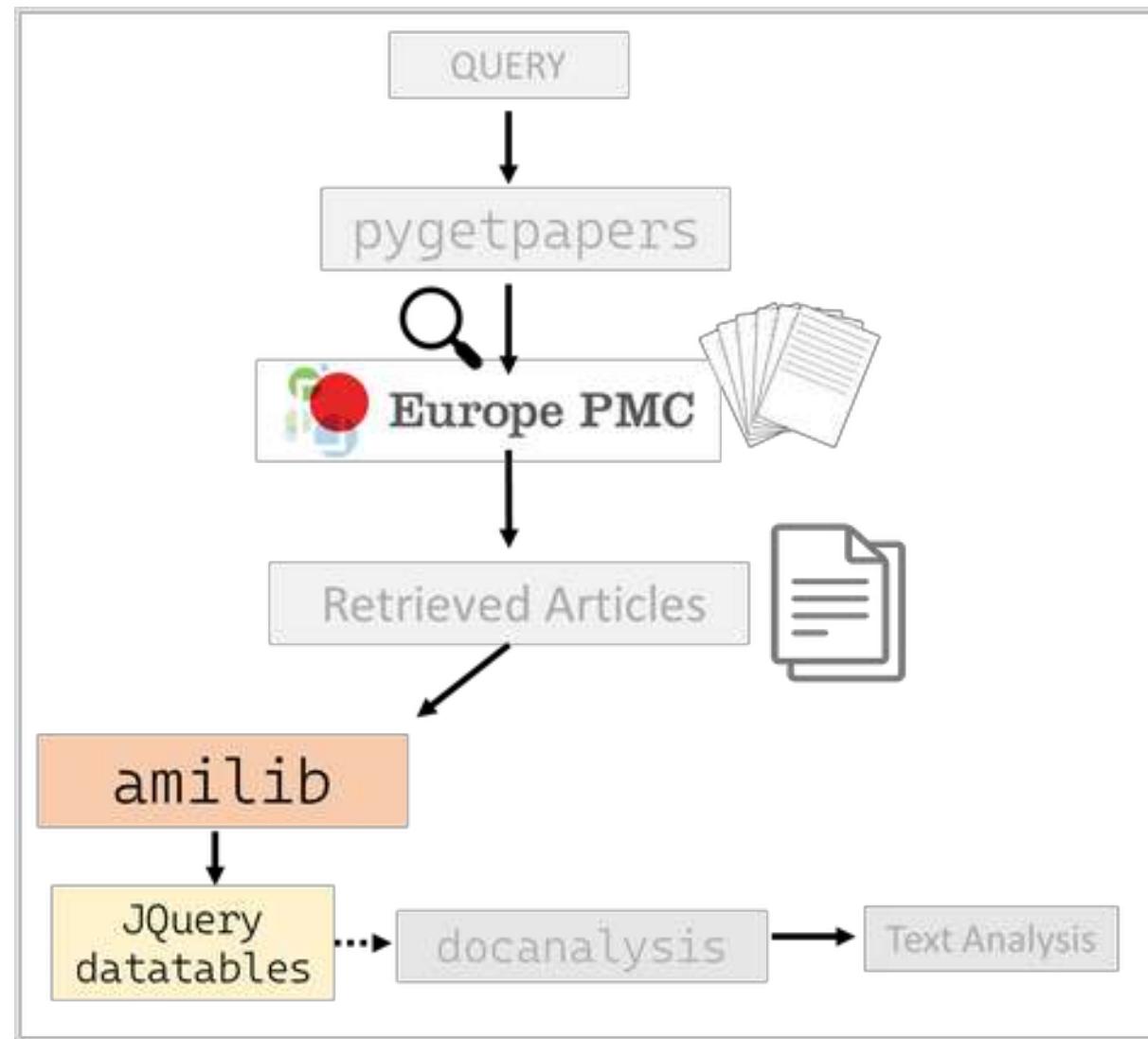
Installing our tools on the command line

```
pip install --pygetpapers  
pip install --amilib==0.3.9  
pip install --docanalysis
```

```
pygetpapers --query "Ocean Acidification" --xml --limit 20 --startdate "2010-04-05"  
--enddate "2011-04-05" --output ocean_acid --save_query
```



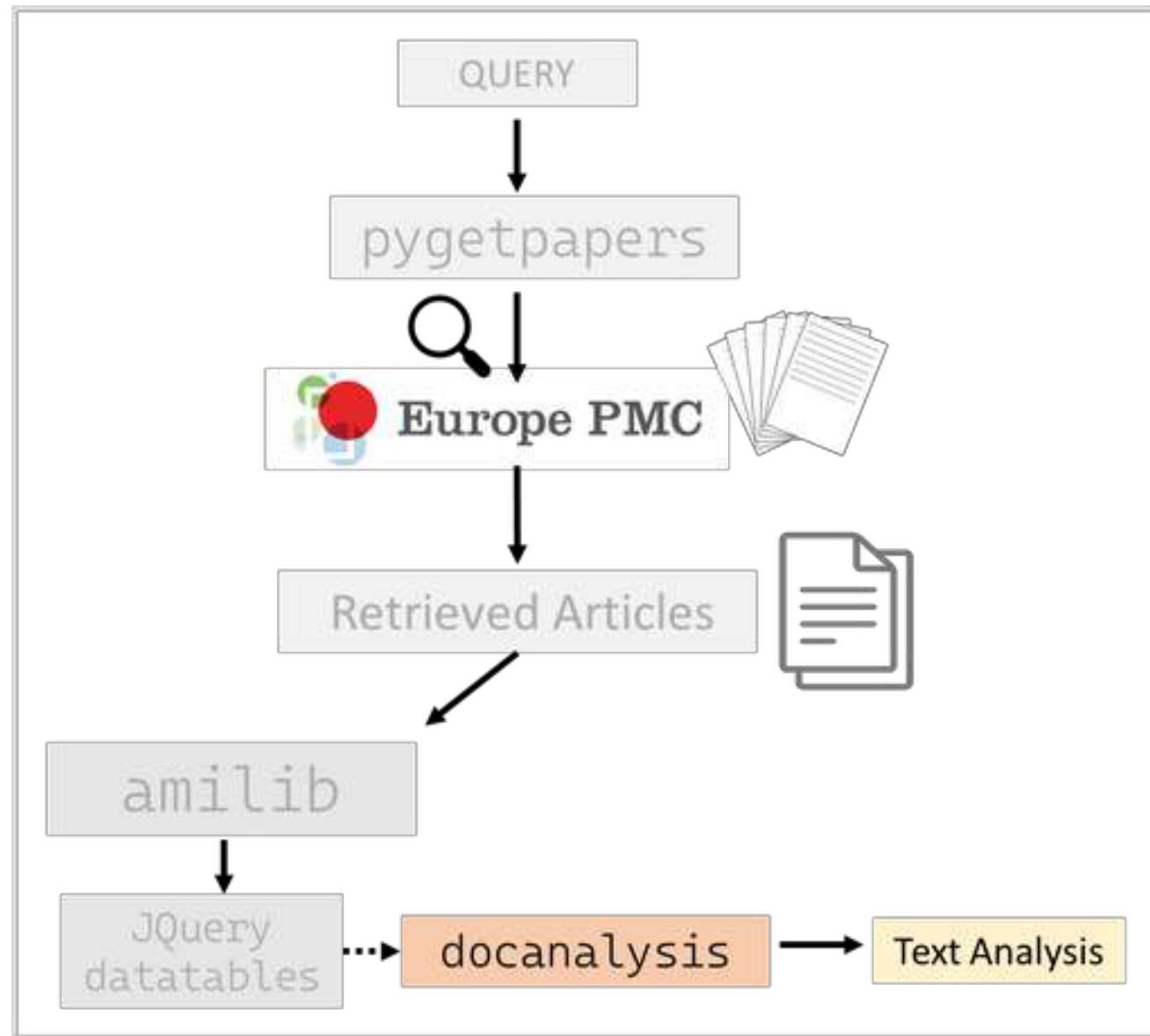
```
amilib HTML --operation DATATABLES --indir ocean_acid
```



Jquery datatable

pmcid	doi	title	authorString	journalInfo.journal.title	pubYear	abstractText
PMC2884040	10.1121/1.3425741	Internal waves as a proposed mechanism for increasing ambient noise in an increasingly acidic ocean.	<ul style="list-style-type: none"> Rouseff D Tang D. 	The Journal of the Acoustical Society of America	2010	The effect on the ambient noise level in shallow water of the ocean growing more acidic is modeled. Because most noise sources are near the surface, high-order acoustic modes are preferentially excited.
PMC2889361	10.1073/pnas.0914065107	Calcium isotope constraints on the end-Permian mass extinction.	<ul style="list-style-type: none"> Payne JL Turchyn AV Paytan A ... Yu M Wei J. 	Proceedings of the National Academy of Sciences of the United States of America	2010	The end-Permian mass extinction horizon is marked by an abrupt shift in style of carbonate sedimentation and a negative excursion in the carbon isotope ($\delta^{13}\text{C}$) composition of carbonate minerals.
PMC2894046	10.1371/journal.pone.0011362	Response of the Arctic pteropod <i>Limacina helicina</i> to projected future environmental conditions.	<ul style="list-style-type: none"> Comeau S Jeffree R Teyssié JL Gattuso JP 	PloS one	2010	Thecosome pteropods (pelagic mollusks) can play a key role in the food web of various marine ecosystems. They are a food source for zooplankton or higher predators such as fishes, whales and birds that
PMC2894059	10.1371/journal.pone.0011372	Impact of ocean warming and ocean acidification on larval development and calcification in the sea urchin <i>Tripneustes gratilla</i> .	<ul style="list-style-type: none"> Sheppard Brennand H Soars N Dworjanyn SA Davis AR Byrne M. 	PloS one	2010	<h4>Background</h4>As the oceans simultaneously warm, acidify and increase in $\text{P}(\text{CO}_2)$, prospects for marine biota are of concern. Calcifying species may find it difficult to produce their skeleton beca
PMC2898876		The Beat		Environmental health perspectives	2010	
PMC2951437		In This Issue		Proceedings of the National Academy of Sciences of the United States of America	2010	

```
docanalysis --project_name ocean_acid --make_section --  
dictionary COUNTRY --output ocean_acid.csv
```



wordcloud



Creating Wikimedia enhanced Dictionary for Climate wordlist extracted from IPCC Corpus

1.1 Report and Chapter Overview



Climate Report

Keyw ord extractio n

- 1 ocean acidification
- 2 carbon capture and storage
- 3 carbon sequestration
- 4 carbon dioxide removal
- 5 calcification
- 6 Habitat fragmentation
- 7 Marine ecosystem
- 8 Plankton
- 9 Aragonite
- 10 Coral bleaching

Climate terms

amilib

Dictionary creation

search term: ocean acidification Wikipedia Page
Ocean acidification is the ongoing decrease in the pH of the Earth's oceans. Between 1950 and 2020, the average pH of the primary cause of ocean acidification, with atmospheric carbon dioxide (CO_2) levels exceeding 422 ppm (as of 2024) which dissociates into a bicarbonate ion (HCO_3^-) and a hydrogen ion (H^+). The presence of free hydrogen ions (H^+) lowers pH higher than 8. Marine calcifying organisms , such as mollusks and corals , are especially vulnerable because they rely on
search term: carbon capture and storage Wikipedia Page
Carbon capture and storage (CCS) is a process by which carbon dioxide (CO_2) from industrial installations is separated CO_2 is captured from a large point source, such as a natural gas processing plant and typically is stored in a deep ocean , which CO_2 is injected into partially-depleted oil reservoirs in order to extract more oil and then is largely left underground storage (CCUS) .
search term: carbon sequestration Wikipedia Page
Carbon sequestration is the process of storing carbon in a carbon pool . It plays a crucial role in mitigating climate change , including biotic (also called biodirectemission) and geologic .
search term: carbon dioxide removal Wikipedia Page
Carbon dioxide removal (CDR) is a process in which carbon dioxide (CO_2) is removed from the atmosphere by deliberate process is also known as carbon removal , greenhouse gas removal or negative emissions . CDR is more and more often necessary will require first and foremost deep and sustained cuts in emissions, and then—in addition—the use of CDR (CO_2 emissions that are technically difficult to eliminate, such as some agricultural and industrial emissions).

Dictionary

Wikimedia enhanced dictionary

search term: ocean acidification [Wikipedia Page](#)

Ocean acidification is the ongoing decrease in the pH of the Earth's ocean. Between 1950 and 2020, the average pH of the ocean surface fell from approximately 8.15 to 8.05.^[2] Carbon dioxide emissions from human activities are the primary cause of ocean acidification, with atmospheric carbon dioxide (CO₂) levels exceeding 422 ppm (as of 2024).^[3] CO₂ from the atmosphere is absorbed by the oceans. This chemical reaction produces carbonic acid (H₂CO₃), which dissociates into a bicarbonate ion (HCO₃⁻) and a hydrogen ion (H⁺). The presence of free hydrogen ions (H⁺) lowers the pH of the ocean, increasing acidity (this does not mean that seawater is acidic yet; it is still alkaline, with pH higher than 8). Marine calcifying organisms, such as mollusks and corals, are especially vulnerable because they rely on calcium carbonate to build shells and skeletons.^[4]

search term: carbon capture and storage [Wikipedia Page](#)

Carbon capture and storage (CCS) is a process by which carbon dioxide (CO₂) from industrial installations is separated before it is released into the atmosphere, then transported to a long-term storage location.^{[1][2][3]} With CCS, CO₂ is captured from a large point source, such as a natural gas processing plant and typically is stored in a deep geological formation. Around 80% of the CO₂ captured annually is used for enhanced oil recovery (EOR), a process by which CO₂ is injected into partially-depleted oil reservoirs in order to extract more oil and then is largely left underground.^[2] Since EOR utilizes the CO₂ in addition to storing it, CCS is also known as carbon capture, utilization, and storage (CCUS).^[3]

search term: carbon sequestration [Wikipedia Page](#)

Carbon sequestration is the process of storing carbon in a carbon pool.^{[2][3]} It plays a crucial role in limiting climate change by reducing the amount of carbon dioxide in the atmosphere. There are two main types of carbon sequestration: biologic (also called biosequestration) and geologic.^[3]

search term: carbon dioxide removal [Wikipedia Page](#)

Carbon dioxide removal (CDR) is a process in which carbon dioxide (CO₂) is removed from the atmosphere by deliberate human activities and durably stored in geological, terrestrial, or ocean reservoirs, or in products.^{[3][4]} This process is also known as carbon removal, greenhouse gas removal or negative emissions. CDR is more and more often integrated into climate policy, as an element of climate change mitigation strategies.^{[4][5]} Achieving net zero emissions will require first and foremost deep and sustained cuts in emissions, and then—in addition—the use of CDR ("CDR is what puts the net into net zero emissions").^[6] In the future, CDR may be able to counterbalance emissions that are technically difficult to eliminate, such as some agricultural and industrial emissions.^[7]^[14]

Datatables (An index for UNFCCC reports)

File	title	pdf
CMA_1/html/13_20_CMA_1/total_pages.html	Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on the third part of its first session, held in Katowice from 2 to 15 December 2018	13_20_CMA_1
CMA_1/html/1_CMA_1/total_pages.html	Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on the first part of its first session, held in Marrakech from 15 to 18 November 2016	1_CMA_1
CMA_1/html/2_CMA_1/total_pages.html	Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on the first part of its first session, held in Marrakech from 15 to 18 November 2016	2_CMA_1
CMA_1/html/3_12_CMA_1/total_pages.html	Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on the third part of its first session, held in Katowice from 2 to 15 December 2018	3_12_CMA_1
CMA_2/total_pages.html	Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its second session, held in Madrid from 2 to 15 December 2019	1_9_CMA_2
CMA_3/total_pages.html	Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its third session, held in Glasgow from 31 October to 13 November 2021	COP26
IA_3/total_pages.html	?	
CMA_3/total_pages.html	Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its third session, held in Glasgow from 31 October to 13 November 2021	
CMA_4/total_pages.html	Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fourth session, held in Sharm el-Sheikh from 6 to November 2022	
CMA_4/total_pages.html	Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its fourth session, held in Sharm el-Sheikh from 6 to November 2022	

Reports in semantic HTML

Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its third session, held in Katowice from 2 to 15 December 2018

Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on its second session, held in Madrid from 2 to 15 December 2019

Marrakech from 15 to 18 November 2016

Addendum

Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement

Contents

Decisions adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement

Decision Page

1/CMA.1 Matters relating to the implementation of the Paris Agreement

2/CMA.1 Rules of procedure of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement

Resolution

1/CMA.1 Expression of gratitude to the Government of the Kingdom of Morocco

United Nations FCCC PA/CMA/2016/3/Add.1

Distr.: General 31 January 2017

Original: English

Decision 1/CMA.1

Decisions adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement

Reports in Pdf

 United Nations Framework Convention on Climate Change	FCCC PA/CMA/2016/3/Add.1 Date: General 31 January 2017 Original: English
Conference of the Parties serving as the meeting of the Parties to the Paris Agreement	
Report of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement on the first part of its first session, held in Marrakech from 15 to 18 November 2016	
Addendum	
Part two: Action taken by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement	
Contents	
Decisions adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement	
Decision	
1/CMA.1	Matters relating to the implementation of the Paris Agreement
2/CMA.1	Rules of procedure of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement

The screenshot shows a search interface with a sidebar on the left containing various climate-related terms and their definitions. The main area displays three search results highlighted with a red box:

- Biomass « WGI,WGIII,WGII »**
- Biomes « WGII »**
- Biosphere (terrestrial and marine) « WGI,WGII »**

A red arrow points from the sidebar entry "Biological (carbon)" to the first result. A purple arrow points from the second result to the third one.

Biomes « WGII »

AR6

Global-scale zones, generally defined by the type of plant life that they support in response to average rainfall and temperature patterns. For example, tundra, coral reefs or savannas (IPBES, 2019).



semanticClimate annotation

From Wikipedia Biomes is the term of living biological organisms in a given area or ecosystem of a given biome. Biomes can refer to various biomes, which is the term of a community biome, which is the most common. It can include microorganisms, plants, animals, soil organic matter and genetic material.

biomes

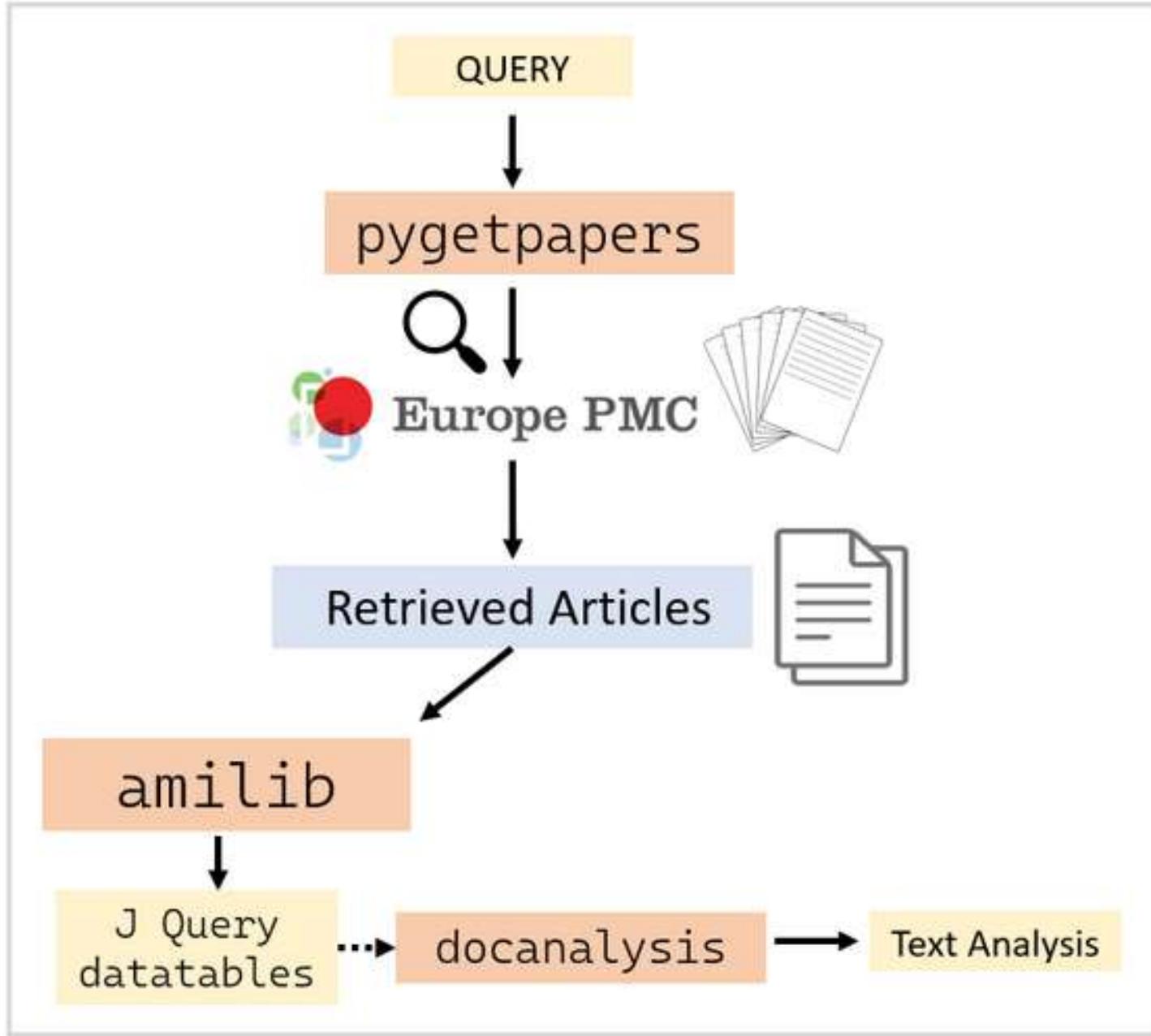
Different areas, generally defined by the dominant responses to average rainfall and temperature. For example, forests, deserts, grasslands, etc.

semanticClimate annotation

From Wikipedia A biome (/baɪəʊm/) is a biological community that has formed in response to its environment. Translations

- HI: जैवक्षेत्र

**semantic IPCC Glossary enhanced with pictures and
descriptions from Wikimedia**



IPCC
Report



Keyword Extraction

- 1 ocean acidification
- 2 carbon capture and storage
- 3 carbon sequestration
- 4 carbon dioxide removal
- 5 calcification
- 6 Habitat fragmentation

Wordlis
t

amilib



Wikimedia
enhanced
Dictionary

report	remote_chapter	remote_PDF	cleaned_chapter	chapter_with_ids
wgl	Chapter02	Chapter02.PDF		
wgl	Chapter03	Chapter03.PDF		
wgl	Chapter04	Chapter04.PDF		
wgl	Chapter05	Chapter05.PDF		
wgl	Chapter06	Chapter06.PDF		
wgl	Chapter07	Chapter07.PDF		
wgl	Chapter08	Chapter08.PDF		
wgl	Chapter09	Chapter09.PDF		
wgl	Chapter10	Chapter10.PDF		
wgl	Chapter11	Chapter11.PDF		
wgl	Chapter12	Chapter12.PDF		
wg2	Chapter01	Chapter01.PDF		
wg2	Chapter02	Chapter02.PDF		
wg2	Chapter03	Chapter03.PDF		

ipcc

REPORTS SYNTHESIS REPORT WORKING GROUPS
NEWS CALENDAR

Working Group II Impacts, Adaptation and Vulnerability

2 Changing State of the Climate System

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IPCC
Chapters

PDF

HTML with
ids
(semantic)

Executive Summary

It is unequivocal that the increases in atmospheric carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) in the atmosphere is determined by the balance between anthropogenic emissions and dynamics on land and in the ocean. This chapter assesses how physical and biogeochemical processes of the atmosphere as well as ocean acidification and deoxygenation. It identifies physical and biogeochemical accumulation in the atmosphere, and therefore, influence climate change and its impacts. This chapter also a various goals, as well as the large-scale consequences of carbon dioxide removal (CDR) and solar radiation

The Human Perturbation of the Carbon and Biogeochemical Cycles

Global mean concentrations for well-mixed GHGs (CO_2 , CH_4 and N_2O) in 2019 correspond to increases (representative of the pre-industrial era) (high confidence). Current atmospheric concentrations of the three in 2019 reached 409.9 parts per million (ppm) of CO_2 , 1886.5 parts per billion (ppb) of CH_4 , and 332.1 ppb. Atmosphere are also unprecedented in the last 2 million years (high confidence). In the past 60 million years were significantly higher than at present, but multiple lines of evidence show that the rate at which CO_2 is faster than at any other time during the last 800,000 years (high confidence), and 4–5 times faster than due to 5.4; Cross-Chapter Box 2.1).

Chapter 5: Global Carbon and other Biogeochemical Cycles

BODY

CHAPTER-BUTTONS

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de_gatsby
format



#semantic*Climate*
Transforming information into actionable knowledge

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