



# Scholarly & Policy Perspectives of Open Access: Innovation & Transformation

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[www.mpic.de/4123205/open-access](http://www.mpic.de/4123205/open-access)

*Perspektive offene Wissenschaft @ RMU 2022*

# Outline

## Introduction & Motivation

- Max Planck Institute for Chemistry: Earth System & Life Sciences in the Anthropocene
- Open Access for Science & Society: Practical Examples & Overarching Goals

## Innovation: Interactive Open Access Publishing, Open Peer Review & Epistemic Web

- Atmospheric Chemistry & Physics, European Geosciences Union
- Other Examples: PLoS, SciPost Physics, F1000/Wellcome Open Research, eLife etc.

## Transformation: Bottom-Up & Top-Down

- Community-Driven Initiatives: Berlin/Bethesda/Budapest Conferences, OA2020
- Political & Funder Mandates: Plan S & cOAlition S, US WH-OSTP Policy

## Conclusions & Suggestions

- Explore new ways & transform subscriptions

# Max Planck Institute for Chemistry (MPIC)



1911/12 foundation & opening  
as first KWI/MPI in Berlin Dahlem  
*(together with FHI)*

L. Meitner first female scientific member (1913)



1944/49 relocation from Berlin  
via Tailfingen to Mainz

O. Hahn first president of MPG (1948);  
byname “Otto-Hahn-Institute” (1959)



2011/12 centennial anniversary  
& relocation into new building,  
“Hahn-Meitner-Weg 1”

Current size & budget: approx. 330 researchers  
& staff members, approx. 20 Million EUR/year

## Organic & Inorganic Chemistry

1915 Nobel Prize R. Willstätter: Chlorophyll  
*(first Nobel Prize for KWG/MPG)*

## Radiochemistry & Nuclear Physics

1944 Nobel Prize O. Hahn: Nuclear Fission

## Physical Chemistry

Mass Spectrometry & Isotopes

## Geo- & Cosmochemistry

Mantle, Meteorites, Moon & Mars

## Atmospheric & Biogeochemistry

1995 Nobel Prize P. Crutzen: Ozone Chemistry

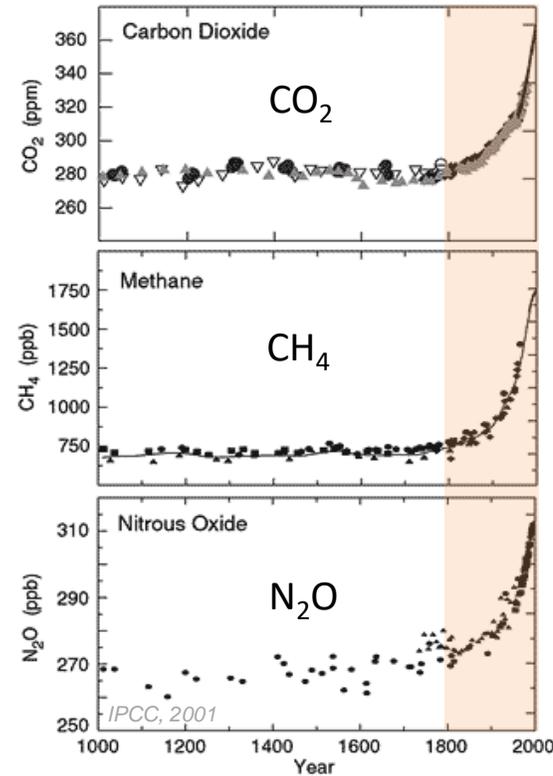
## Earth System Chemistry

Integral scientific understanding of  
chemical processes in the Earth system:

- from molecular to global scales
- from climate change to public health
- from Earth history to the Anthropocene



# The Anthropocene: A new age in Earth history driven by human activity

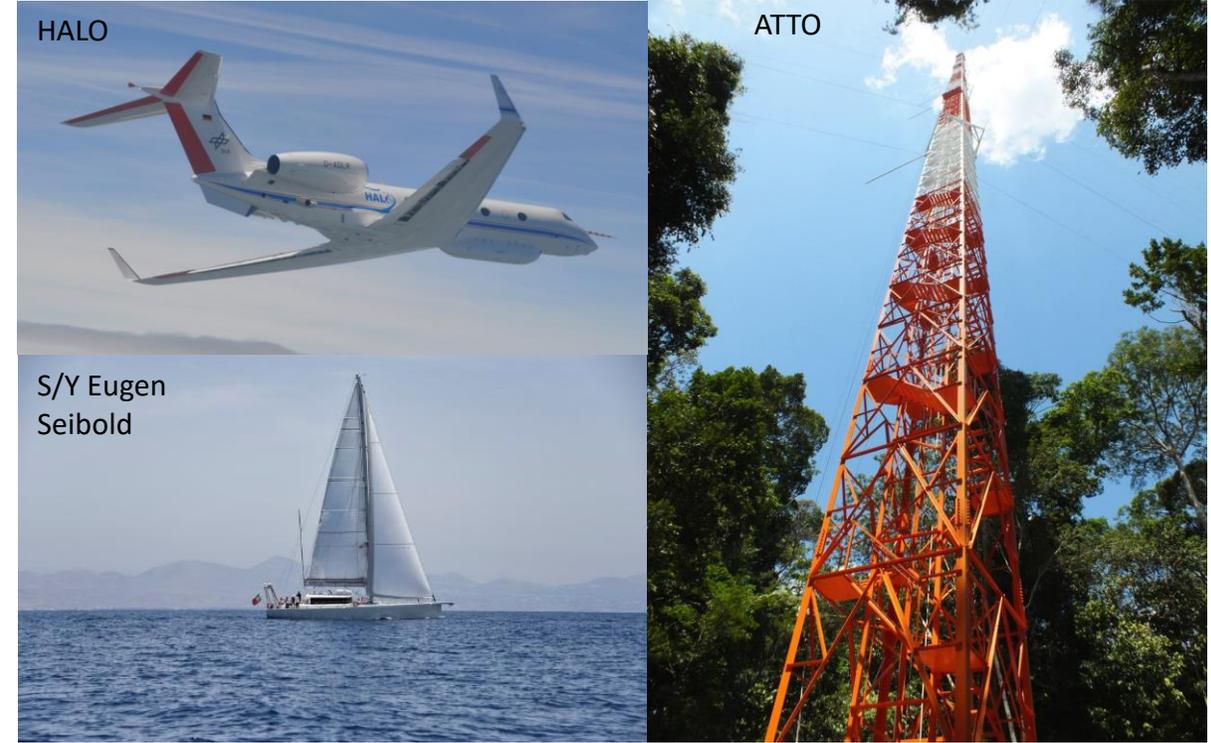
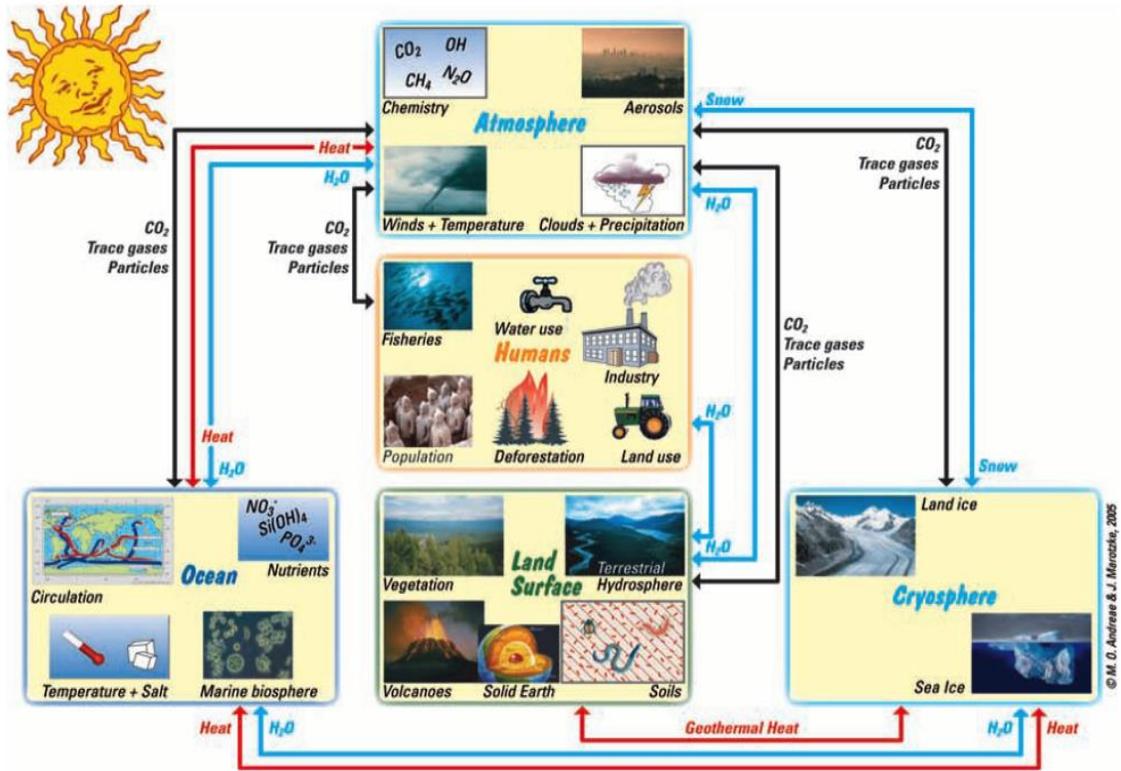


## Globally pervasive & steeply increasing anthropogenic influence on planet Earth:

scientific curiosity & discovery meet practical challenges & philosophical questions - from air quality, ozone hole & climate change to public health & human well-being (“planetary health”, earth & life sciences)

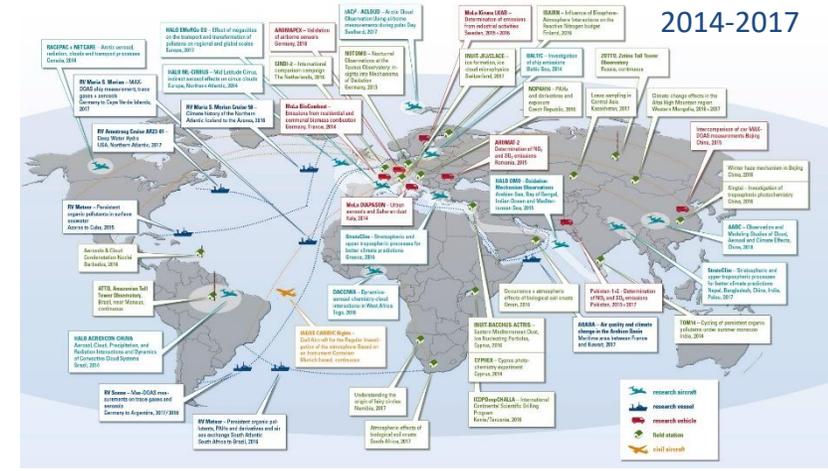
**Scientific & societal message:** we are shaping the planet, so let's try to get it right

# MPIC – Scientific Approach & Methods

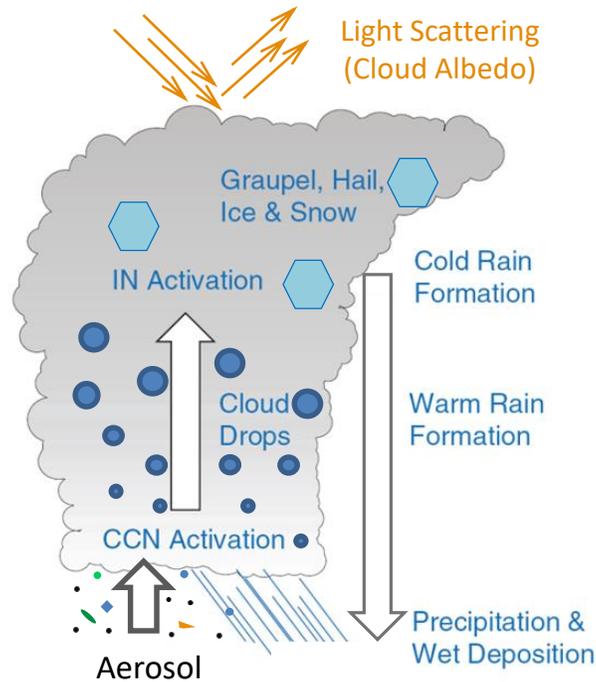


## Combined Field Observations, Laboratory Experiments & Model Studies

- **Aircraft & Ship Campaigns:** HALO, CARIBIC, RVS Seibold ...
- **Ground & Satellite Observations:** ATTO, ZOTTO ...
- **Process Studies & Numerical Models:** EMAC, WRF-CHEM, KM-SUB/GAP ...
- **Earth & Solar System Research Partnership (ESRP):** MPI-C Mainz; MPI-M Hamburg, MPI-BGC Jena, MPI-SSR Göttingen & Partners



# Earth Sciences: Amazonian Aerosol-Cloud-Climate Interactions



## Major uncertainties in climate change prediction

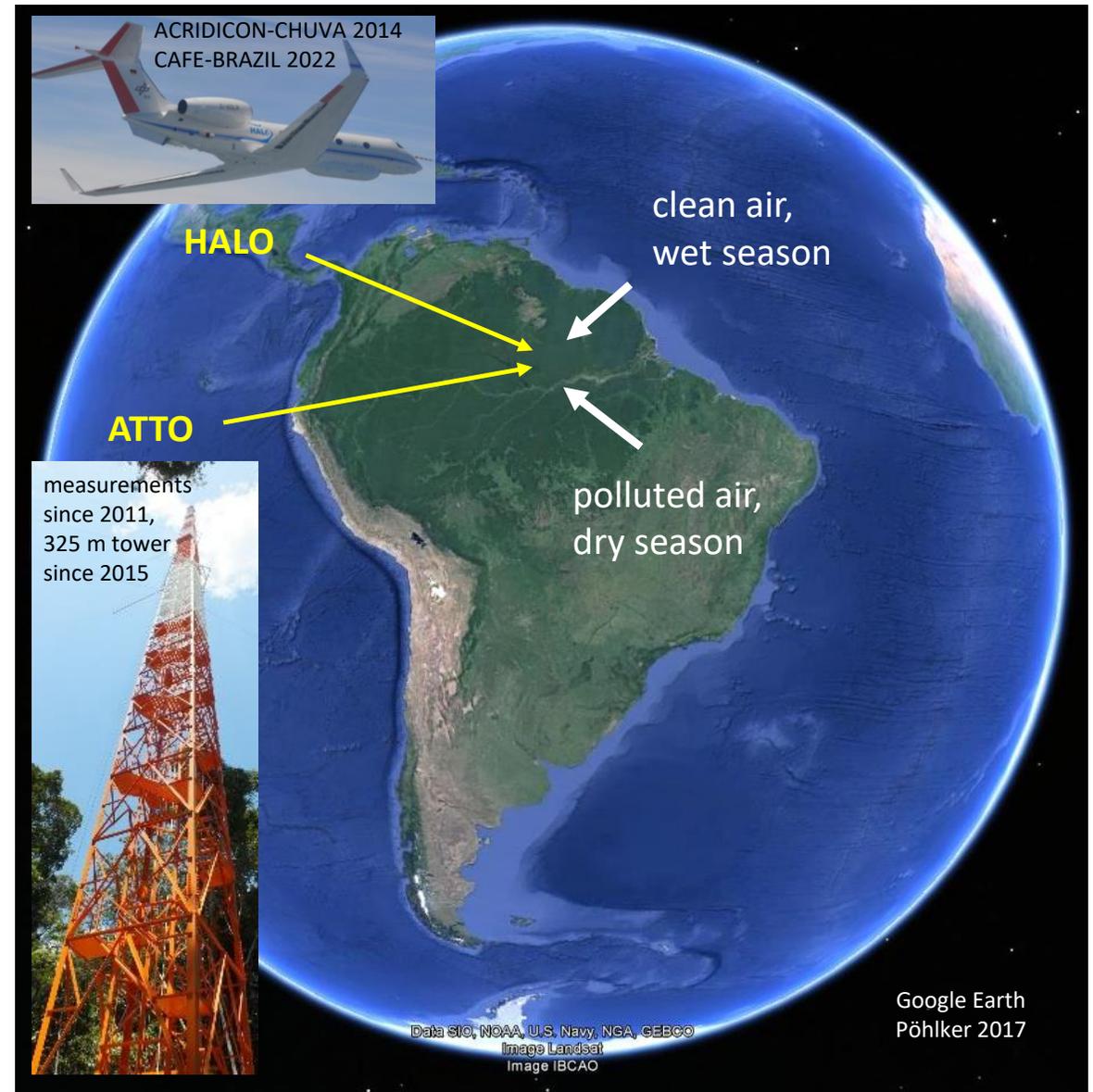
- aerosol effects on cloud formation & properties: albedo, dynamics, lifetime, precipitation ...
- pre-industrial baseline & pristine conditions ?

## Amazon as cloud laboratory & “time machine”

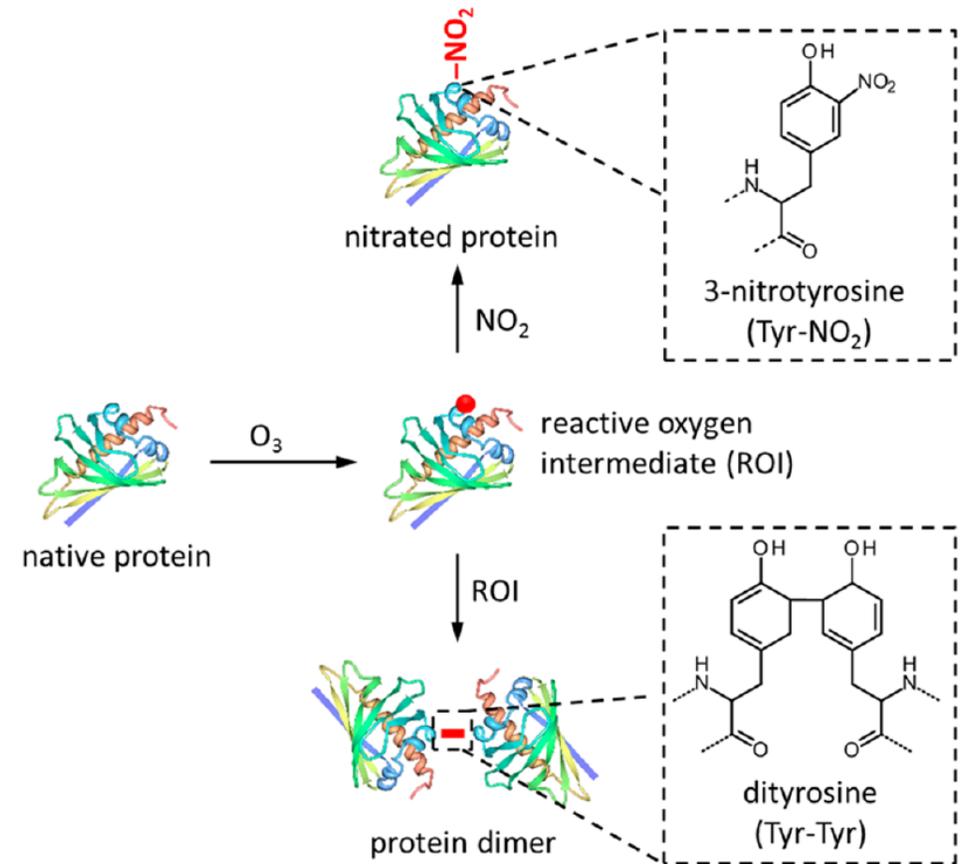
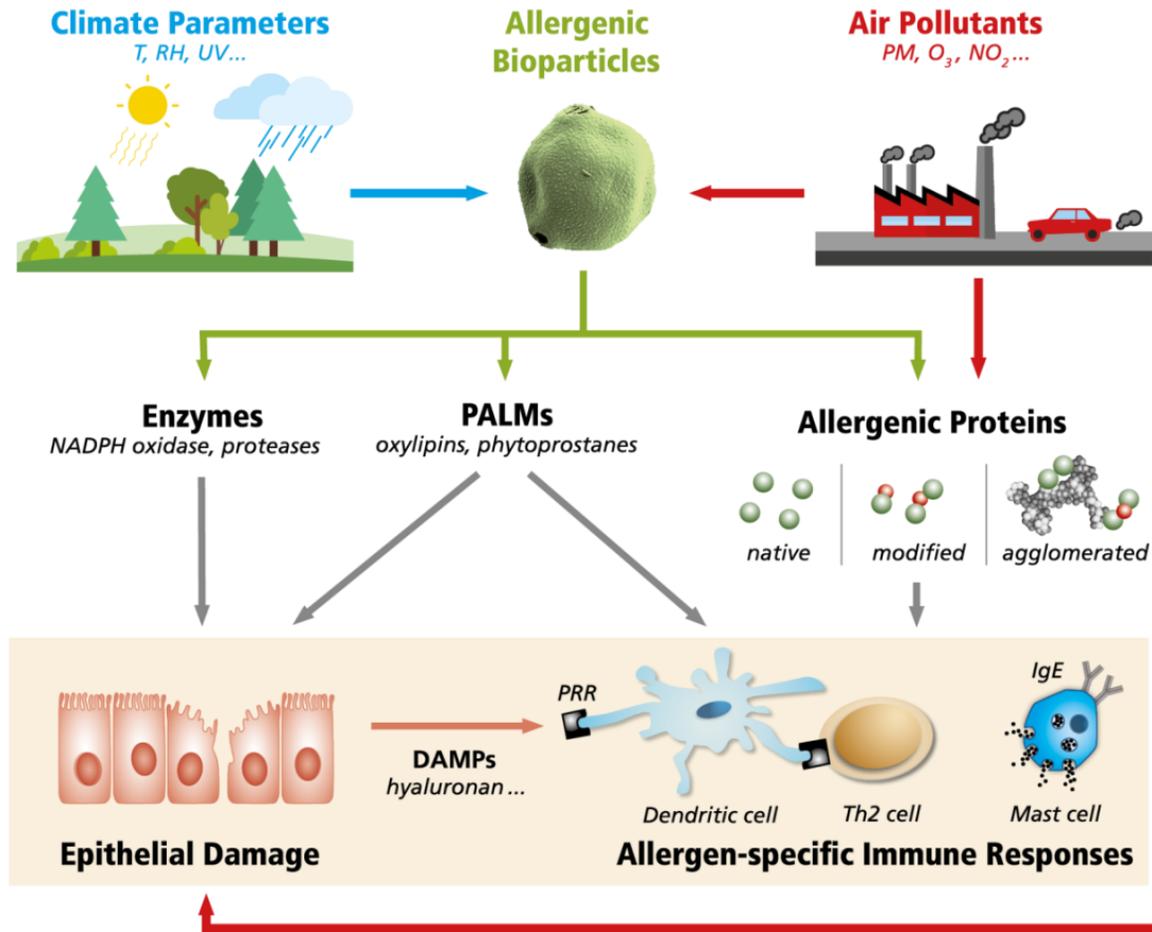
wet vs. dry season, clean vs. polluted conditions

→ approximate pristine pre-industrial baseline

→ contrast by biomass burning pollution



# Life Sciences: Air Pollution & Allergies



**Chemical modification of proteins by atmospheric & physiological reactive species (O<sub>3</sub>, NO<sub>2</sub>, ONO<sub>2</sub><sup>-</sup> ...):**

→ nitrated proteins & oligomers can act as trigger or enhance immune responses (inflammation & allergies)

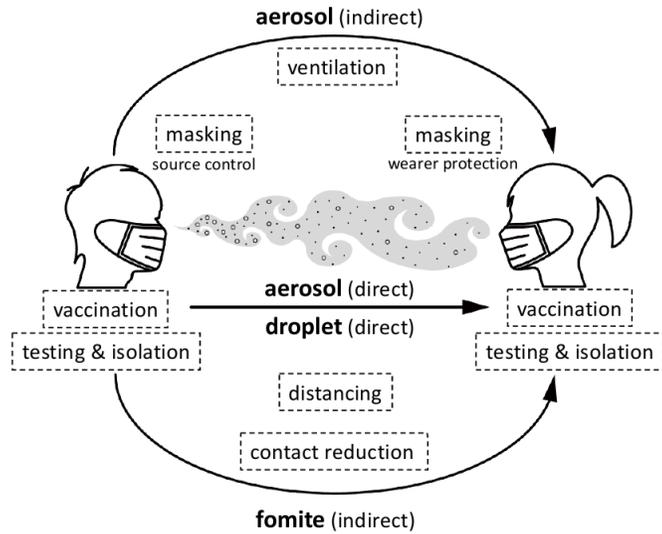
Pathways for climate parameters & air pollutants to influence release, potency, and effects of allergens & adjuvants:

**How may air pollutants trigger an allergy, i.e., a false alarm of the immune system ?**

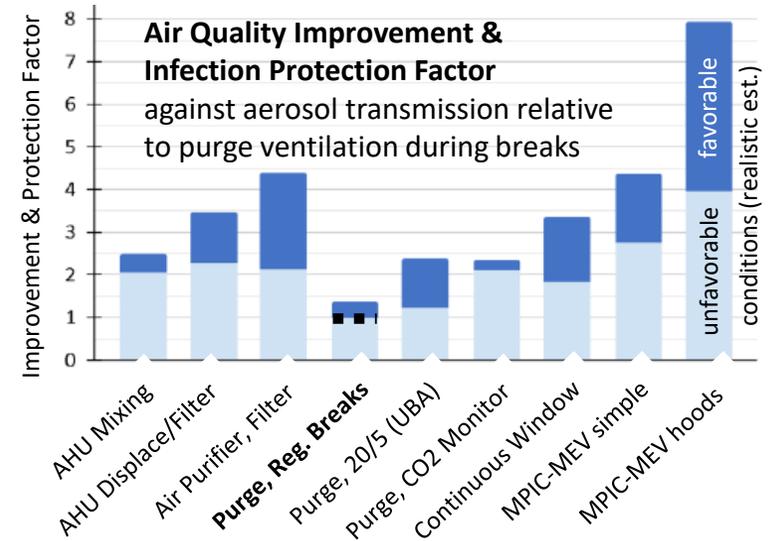
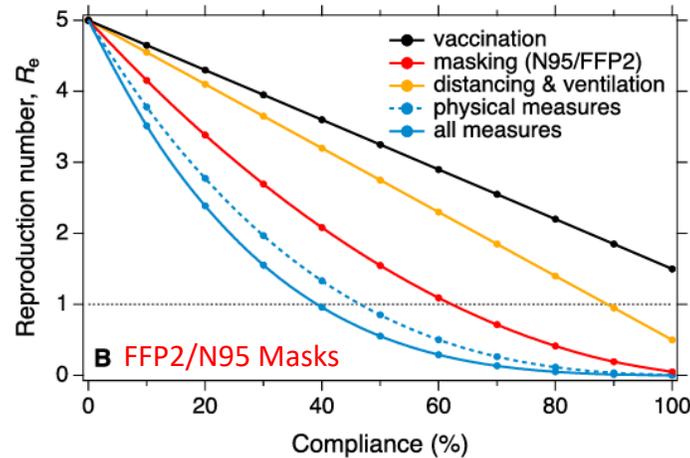
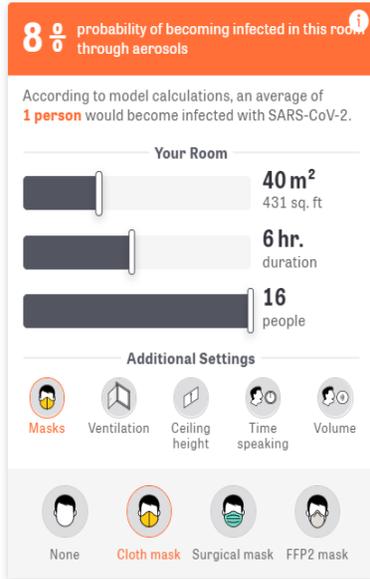
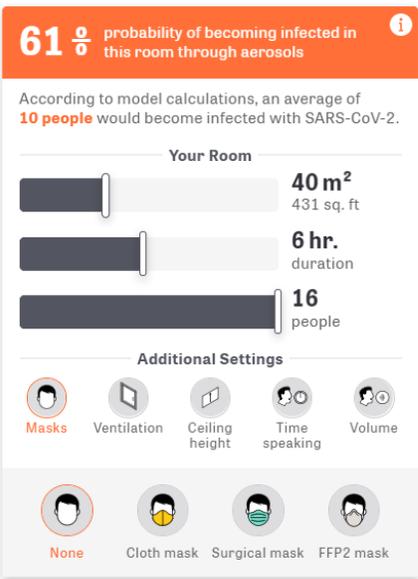
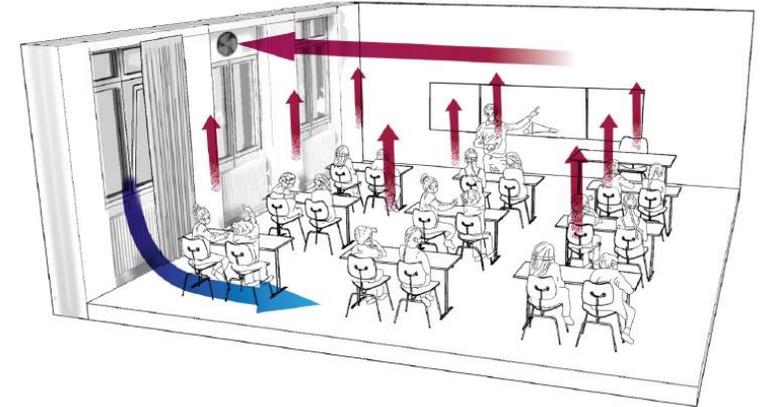
# Assessment & Synergy of Protective Measures Against COVID-19

no masks, no ventilation:  
~ 61% infection risk

cloth masks & window ventil.:  
~8% infection risk (aerosol)



Simple mechanical extract ventilation (MPIC-MEV)



Assess & explain individual infection risks & protective measures

Lelieveld et al. *IJERPH* 2020, Pöhlker et al. *arXiv* 2021  
MPIC & ZEIT ONLINE 2020/2021

Quantify population average efficacy of protective measures

Cheng et al., *Science* 2021  
Su et al. *medRxiv* 2021

Assess efficiency of classroom ventilation methods: CO2, aerosol, energy, costs etc.

Helleis et al. *Zenodo* 2021/2022;  
McLeod et al. *Indoor Air* 2022

# Motivation & Goals of Open Access

*Educational, economic & scholarly advantages of free & immediate online availability & usability of scholarly research articles*

## Educational:

- equal opportunities, information & stimulation (*global/social, teachers/students ...*)
- **re-integrate scholarly & common knowledge** (*Wikipedia, real vs. alternative facts, climate, pandemic ...*)

## Economic:

- facilitate innovation (*text mining by SME ....*)
- liberate distorted market of scientific information (*copyright ...*)

## Scholarly:

- enhance interdisciplinary exchange, discussion collaboration
- **advance scholarly evaluation & quality assurance:** *open review & discussion, transparency & new metrics beyond citation counting oligopoly ...*

## Open Access Variants:

- **OA archiving** (“green”): good but not enough (*delays & limits in usability & sustainability*)
- **OA publishing** (“gold”): immediate & full benefits and sustainability

# Motivation & Goals of Open Peer Review

*Traditional peer review is insufficient for efficient quality assurance in today's highly diverse & rapidly evolving world of science.*

## **Editors & Reviewers: limited capacities**

- work overload, conflicts of interest, little reward & incentive for constructive reviews

## **Traditional Pre-Publication Peer Review: retardation & loss of information**

- delay of publication, dilution of messages, hidden obstruction/plagiarism
- critical & supportive comments unpublished/lost (often as interesting as paper)  
⇒ *waste of reviewer capacities as most limited resource in scientific evaluation*

## **Traditional Discussion: sparse & late commentaries**

- laborious, delayed & diluted by review (comment/article 1978 ⇒ 1998: 1/20 ⇒ 1/100)

**Replacement** of traditional pre-publication review by post-publication commenting not really successful (comments/article < 5/100)

**Evolution into Multi-Stage Open Peer Review: combine & integrate** strengths of traditional peer review with virtues of **transparency, discussion & self regulation**

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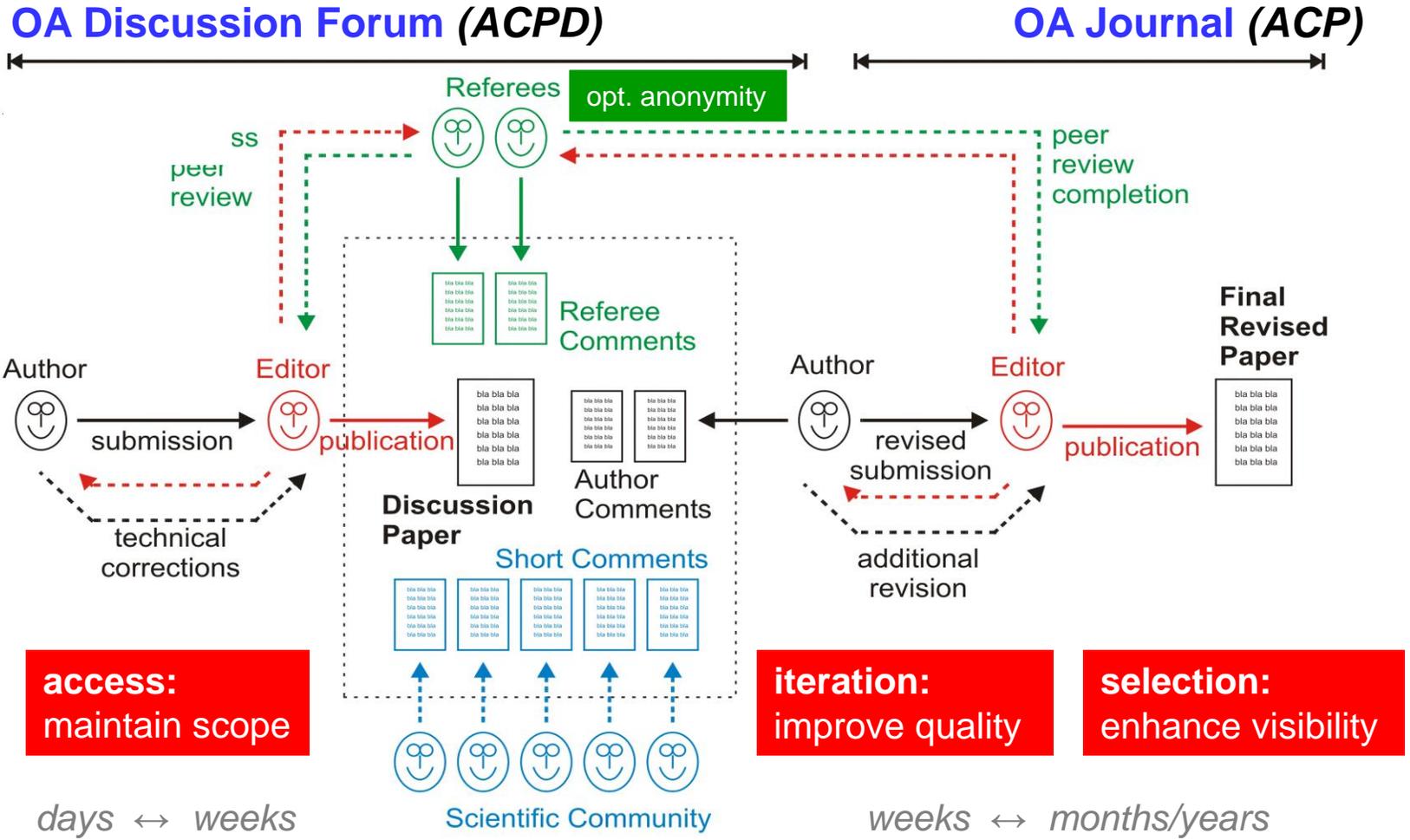
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# Interactive Open Access Publishing 1.0 @ Atmos. Chem. Phys. (since 2001)

*Flexible & transparent advancement of traditional journal review:*



1. Pre-publication review & selection  
short term
2. Public peer review & interactive discussion  
mid-term, **integrative !**
3. Peer review completion  
mid term
4. Post-publication review & evaluation  
long-term, **ALM ...**

# Advantages of Multistage Open Peer Review

*All-win situation: authors, referees, editors, readers, community*

## Discussion Paper

- **free speech**, rapid publication, citable record (*authors, readers*)

## Public Peer Review & Interactive Discussion

- direct feedback & public recognition for high quality papers (*authors*)
- prevent hidden obstruction & plagiarism (*authors, editors*)
- **foster & document scientific discourse**: critical comments, constructive suggestions, complementary information (*authors, referees, readers, editors*)
- document controversial arguments & innovations or flaws & misconduct (*referees, editors, readers*)
- deter submission of weak & false papers ⇒ **save reviewer capacities** (*referees, editors*)

## Final Paper

- **maximize quality assurance & information density** through integration of peer review, public discussion & final revision (*readers*)



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**Journal metrics**

**IF 5.053**

**IF 5-year 5.656**

**SNIP 1.574**

Atmos. Chem. Phys., 16, 3761-3812, 2016  
<http://www.atmos-chem-phys.net/16/3761/2016/>  
doi:10.5194/acp-16-3761-2016  
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- Article **Peer review** Metrics Related articles

Research article

22 Mar 2016

**Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming could be dangerous**

James Hansen et al.

Download

- [Final revised paper](#) (published on 22 Mar 2016)
- [Supplement to the final revised paper](#)
- [Discussion paper](#) (published on 23 Jul 2015)
- [Supplement to the discussion paper](#)

**Hansen et al. 2016: *climate change, 110 comments, 290 000 views***  
[acp.copernicus.org/articles/16/3761/2016/acp-16-3761-2016-discussion.html](http://acp.copernicus.org/articles/16/3761/2016/acp-16-3761-2016-discussion.html)

Interactive discussion

Status: closed

AC: Author comment | RC: Referee comment | SC: Short comment | EC: Editor comment

- Printer-friendly version - Supplement

- SC C5202: 'SC Two papers that conflict with section 2.2. argument for Eemian "superstorm" activity', Andrew Revkin, 26 Jul 2015
- SC C5522: 'Is a 10% increase in wind speed enough to increase wave heights enough to move the Bahamian boulders in the Eemian?', Michael Wehner, 31 Jul 2015

- AC C8101: 'Response to SC C5522', James Hansen, 15 Oct 2015
- AC C5615: 'Boulders in the Bahamas: Response to Comment by A. Revkin on paper Ice melt, sea level rise and superstorms: evidence from paleoclimate data, climate modeling, and modern observations that 2 °C global warming could be dangerous', James Hansen, 04 Aug 2015
- SC C5885: 'Boulders show mega-tsunamis and multi-metre sea level rise could result in preventative actions are required urgently', John Nissen, 13 Aug 2015
- AC C7872: 'Response to SC C5885', James Hansen, 12 Oct 2015
- SC C6270: 'Speculations on superstorms', Max Engel, 26 Aug 2015

**Makarieva et al. 2008 & 2013: *meteorology, 33 & 20 comments***  
[acp.copernicus.org/preprints/acpd-2008-0250/](http://acp.copernicus.org/preprints/acpd-2008-0250/)  
[acp.copernicus.org/articles/13/1039/2013/acp-13-1039-2013-discussion.html](http://acp.copernicus.org/articles/13/1039/2013/acp-13-1039-2013-discussion.html)

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Author

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PDF FULL-TEXT XML

- Supplement (2930 KB)

**Short summary**

We use climate simulations, paleoclimate data and modern observations to infer that continued high fossil fuel...

[Read more](#)

- Citation**
- BibTeX
  - EndNote

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# Achievements ACP & EGU

## Atmospheric Chemistry & Physics (ACP)

launched 2001 with Nobel laureate Paul Crutzen &

## European Geosciences Union (EGU)

19 EGU sister journals since then:

*Biogeosciences, Climate, Hydrology, Solid Earth ...*

Large-scale move to interactive OA

publishing in geosciences: 40,000 peer-reviewed papers;

48,000 discussion papers; 180,000 public comments

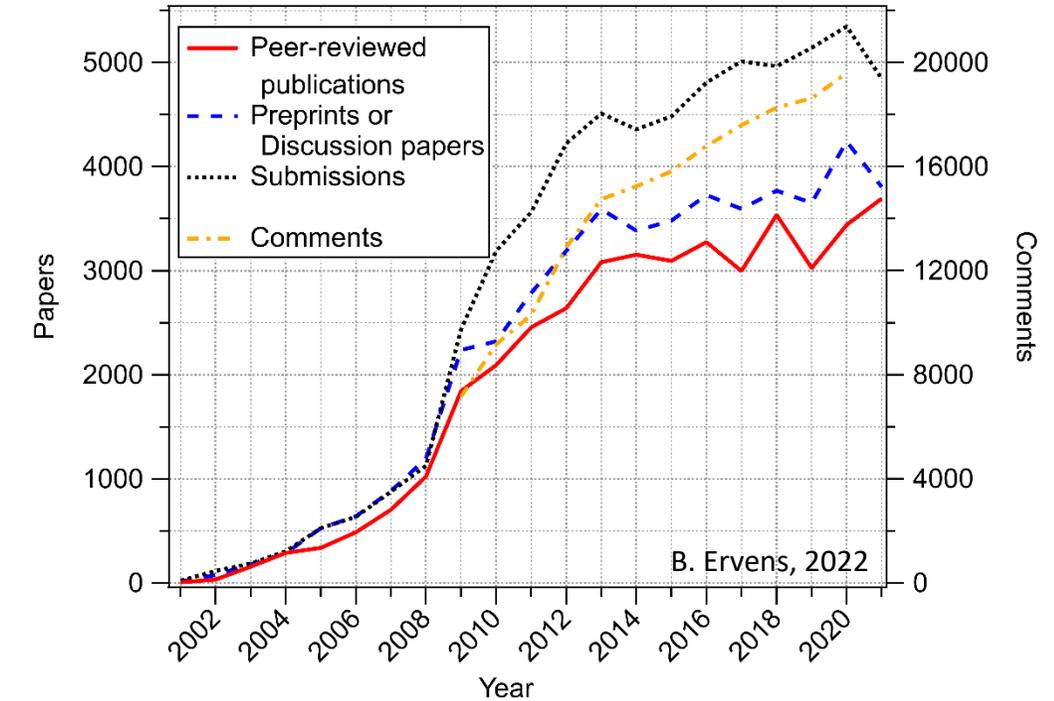
Spread of concept to other communities/platforms:

*Economics e-journal, SciPost Physics/arXiv.org,*

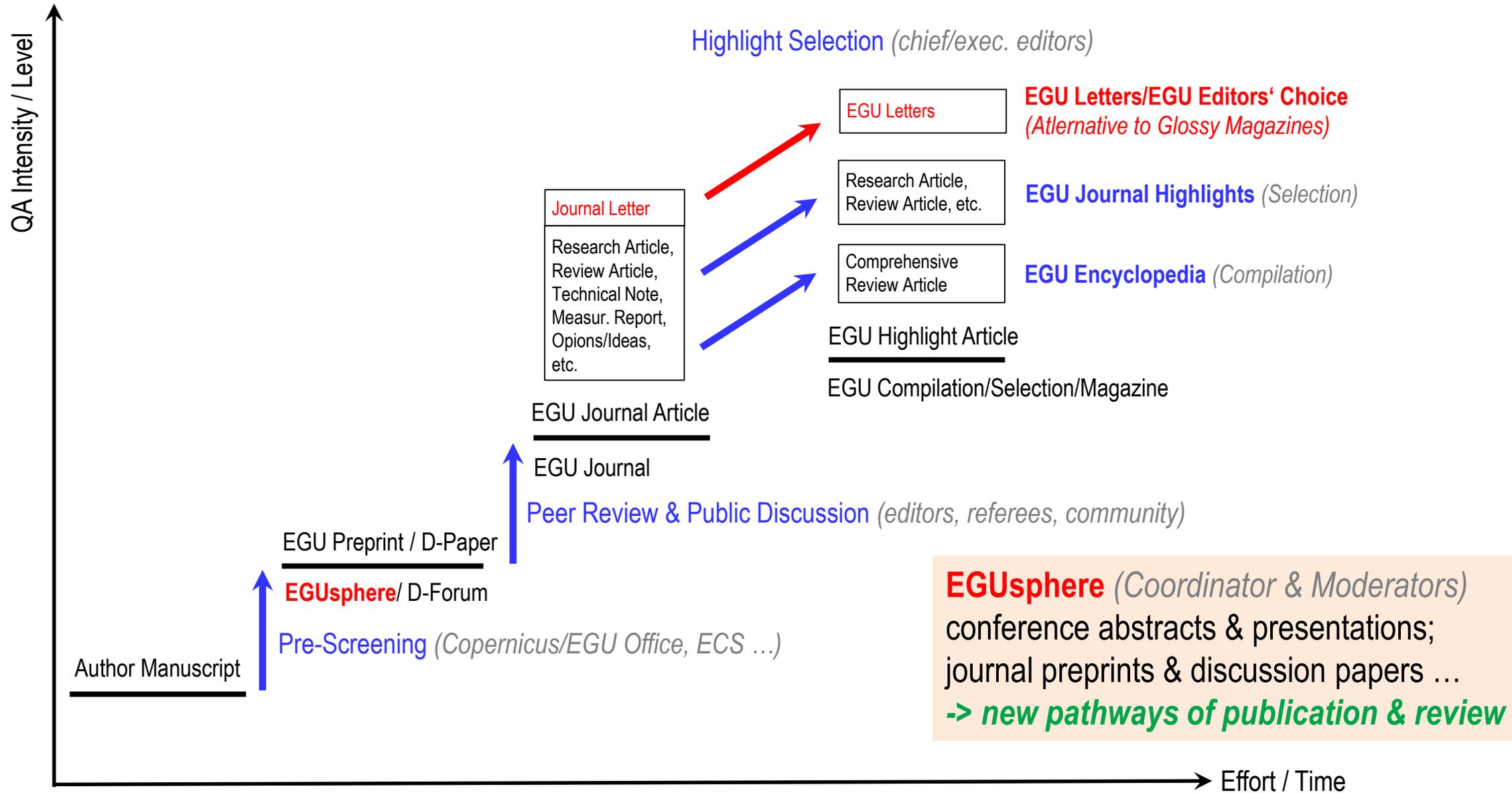
*F1000 Research, Wellcome Open Research ...*

### Unique combination:

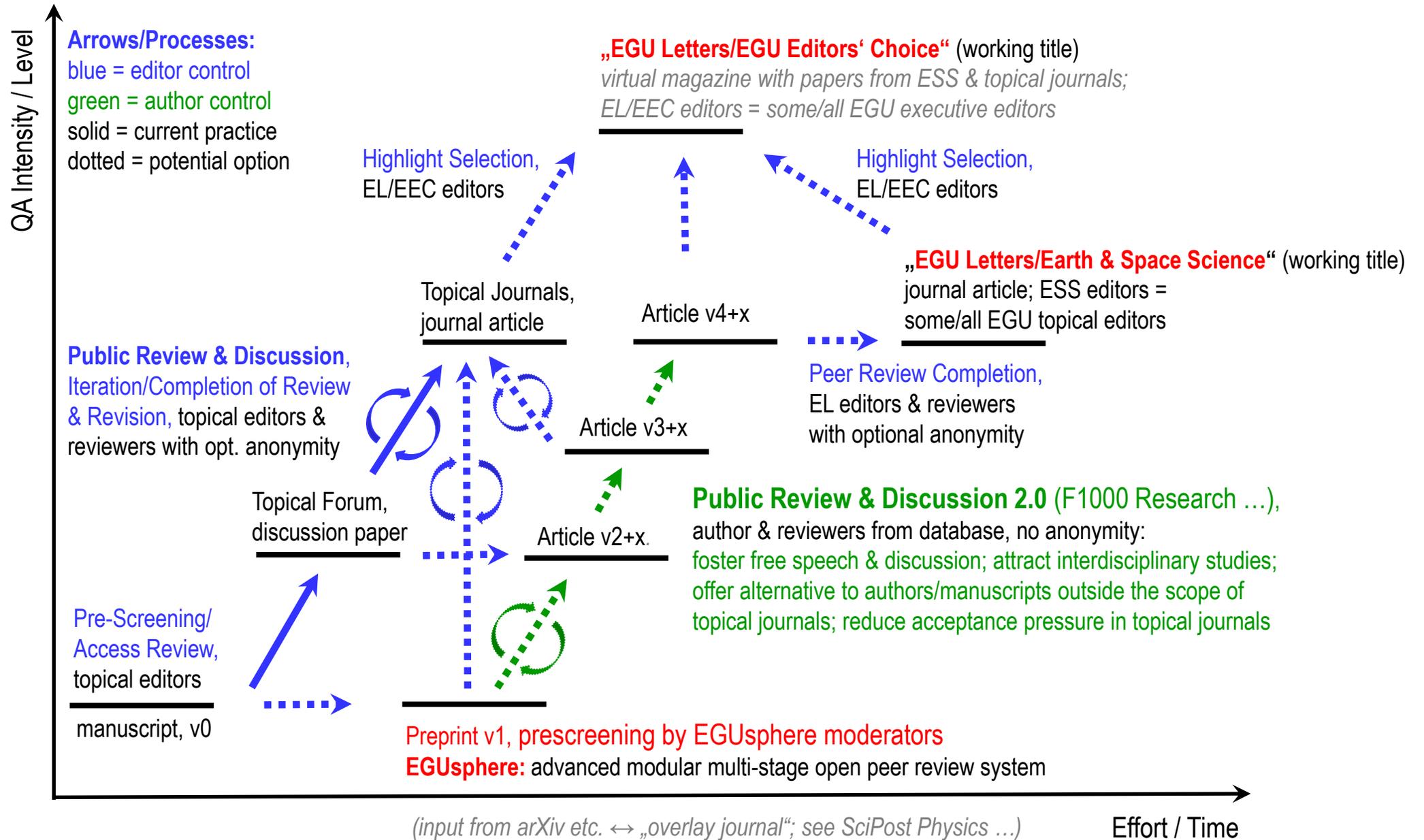
- top speed: 1+x weeks from submission to citable publication (discussion paper)
- top impact & visibility (across atmos., environ. & geosciences)
- low rejection rate (~15% vs. ~50+%)
- large volume (~10% of geoscience journal market)
- low cost (~1 kEUR/paper vs. ~2-4 kEUR/paper)
- fully self-financed & sustainable (incl. review, production, archiving & 10-20% surplus for publisher & society), 2019: ~ 5000 papers, ~ 5 MEUR turnover, > 500 kEUR surplus



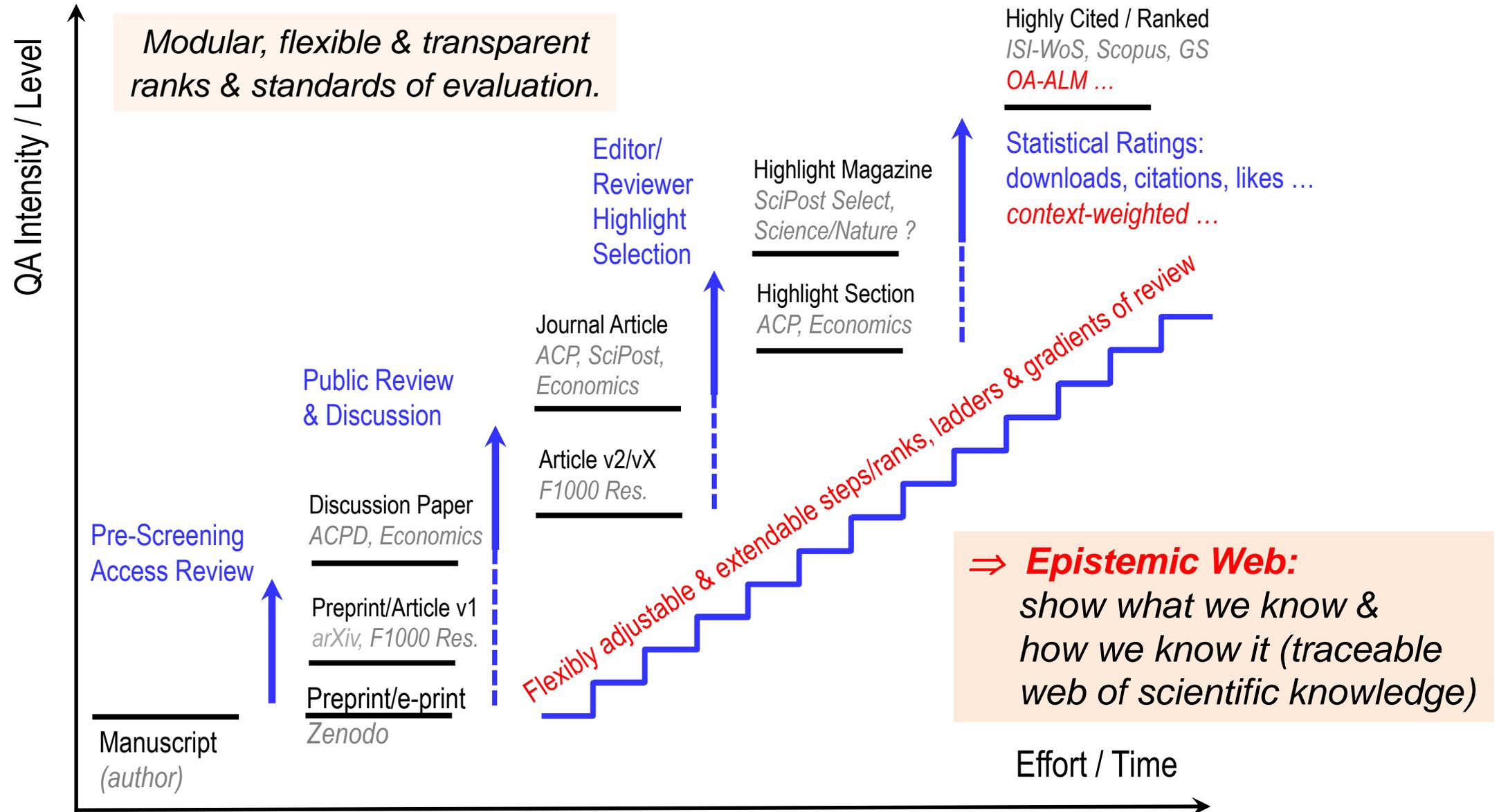
# Interactive OA Publishing 1.1: since 2020, EGUsphere



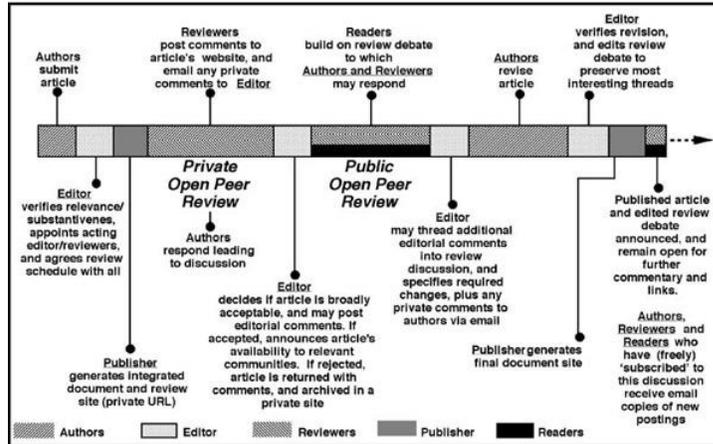
# Interactive OA Publishing 2.0/2.1: work in progress, EGUsphere



# Multi-Stage Open Peer Review & Epistemic Web



# Development & Variants of Multi-Stage Open Peer Review

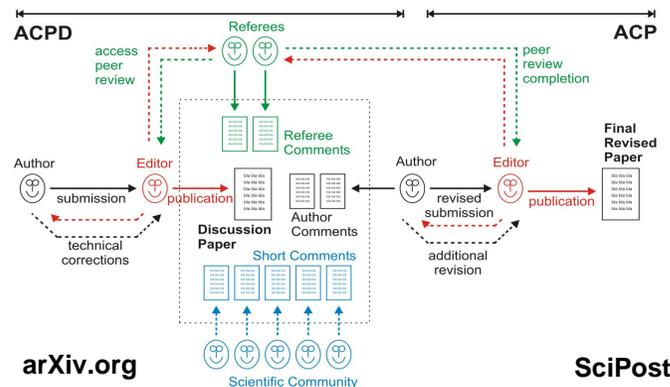


## Electronic Journals (since 1996)

JIME: J. Interactive Media in Education, since 1996, returned to traditional review

ETAI: Electr. Transact. Artificial Intelligence, 1997-2002

... too complex/immature, too early ?



## Forums/Repositories + Journals (since 2001)

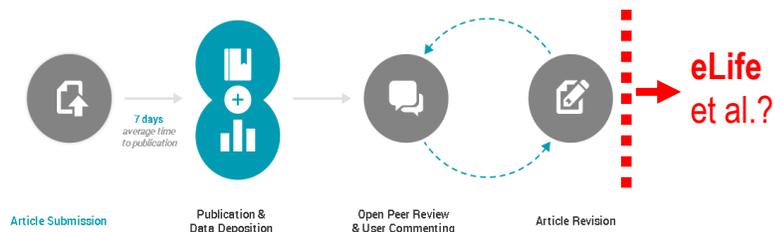
ACP & EGU: Atmos. Chem. Phys. & European Geosciences Union, 15 journals, since 2001

Economics E-Journal: since 2007

SciPost Physics/arXiv.org: since 2016

... well-defined, mature & successfully competing with traditional top journals

similar mechanics & options, why truncate ?



## Platforms w/o Journals (since 2012)

F1000 Research: since 2012

Wellcome Open Research: since 2016

... technical advances vs. conceptual truncation ?  
how to attract & maintain high quality ?

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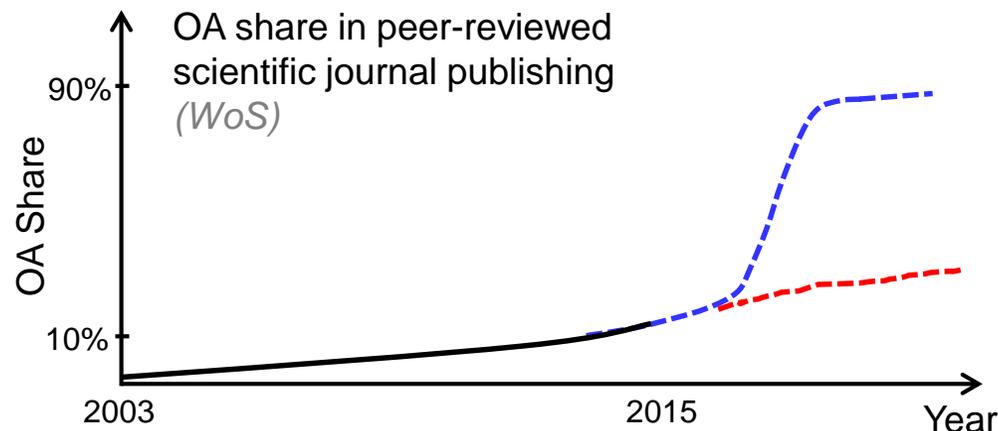
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## Let's act now because ... (B12 OA Conference 2015)

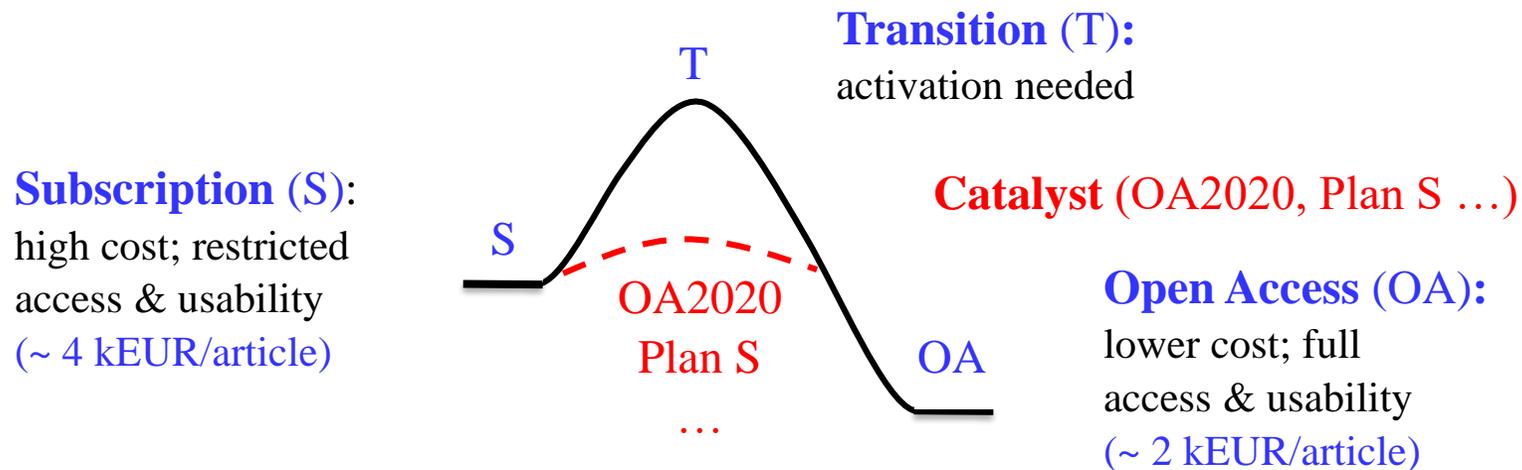


Concerted action is required to reach high OA share swiftly & efficiently  
(long-term contracts ...)

Inactivity leads to slow increase of high quality OA & promotes low quality OA  
(predatory publishers ...)

- OA publishing well established (~20 years); substantial volume achieved (~13% OA journal articles in WoS); tipping point in reach ...
- Politics pay attention and support, traditional publishers start to move
- Junior scientists & public demand free information on the Internet
- OA publishing & increase limited by availability of high quality OA journals: percentage OA publishing  $\approx$  percentage OA journals (WoS: ~1500 of ~12000)
- **Delayed transition may harm integrity & quality of scientific literature:** predatory publishers & self-archiving may erode trad. system before adequate replacement
- **Concerted action enables continuity, stability, and full benefit**
- Pilots & role models available (SCOAP3, AT-IOP, DE-RSC, AT/NL/UK/MPG-Springer ...)
- **Publishing Costs  $\approx$  1-2% of Science Budgets: Let's stop the tail wagging the dog**

# Transition from Subscription to Open Access



Publications carry much of the value but only ~1% of the costs of scientific research: stop the tail wagging the dog, and do not allow ~1% to lock up ~99%!

OA will liberate distorted market (*oligopoly*) and lead to higher value @ lower cost

**Trust & apply the principles of mass/energy conservation & reaction kinetics:**

Necessary funds are already in the system: ~50% buffer (~8 bn EUR/yr vs. ~4 bn EUR/yr)

**Change requires activation:** OA2020 & Plan S serving as energizers & catalysts

**Multiple pathways & tools:** transformative agreements with traditional publishers; continued & extended support for alternative & improved OA publishing platforms

# Financial Conditions in a Nutshell

## Today's subscription & hybrid journal market

total volume of ~8 billion EUR/yr divided by ~2 million articles/yr

⇒ **effective average article processing charge (APC) of ~4000 EUR/article**

*including expensive magazines, large inefficiencies (access & usage barrier costs, long-term oligopoly effects, „divide et impera“), high profits (up to ~40%)*

## Today's proper OA journal market

**conservative average APC of ~2000 EUR/article for high quality OA journals**

*~1500 EUR/yr in top quality OA journals from efficient OA publishers, established since ~20 yrs with substantial surpluses for publishers & learned societies*

## Future OA journal market

conservative average APC of ~2000 EUR/article for ~2 Mio articles/yr

⇒ base volume of ~4 bn EUR/yr for ~2 Mio articles/yr

⇒ **buffer of ~50%** (~4 bn EUR/yr) for APC waivers against undue publication barriers, new & improved services, remaining subscription journals/magazines, etc.

⇒ **budget-neutral OA transformation is possible at short notice**

⇒ **we have plenty of buffering capacities for valid concerns**

⇒ **we can expect substantial savings and/or service improvements**

# How to Achieve an OA Transformation ?

## First-Order Approximation

**(1) maintain** payments & drop paywalls; **(2) adjust** budgets & cash flows

## Second-Order Approximation

**(1) Every organization continues to pay** for some time the same amount as for past journal subscriptions while requesting OA for their corresponding author articles

**(2) Check “effective APC” or “publish & read (PAR) fees”** = subscription fees divided by number of articles for every publisher/journal & every organization/country (*corr. author*)

**(3) Adjust balances** between past & future “effective APCs” or “PAR fees” at institutional, regional & global levels (*those who publish a lot usually also subscribe to a lot, v.v.*), include mechanisms against undue publication barriers (*waivers ...*)

**(4) Move to free/social OA market** (*moderated/regulated by competition/cooperation*)

## Practical Implementation

**(a) Bottom-up by researchers** (*OA2020 et al.*): develop & promote suitable tools and global collaboration: transformative agreements, new & improved publication platforms ...

**(b) Top-down by funders** (*Plan S et al.*): ensure proper use of public funds & resources; enforce co-operation of publishers & end their denial of service ...

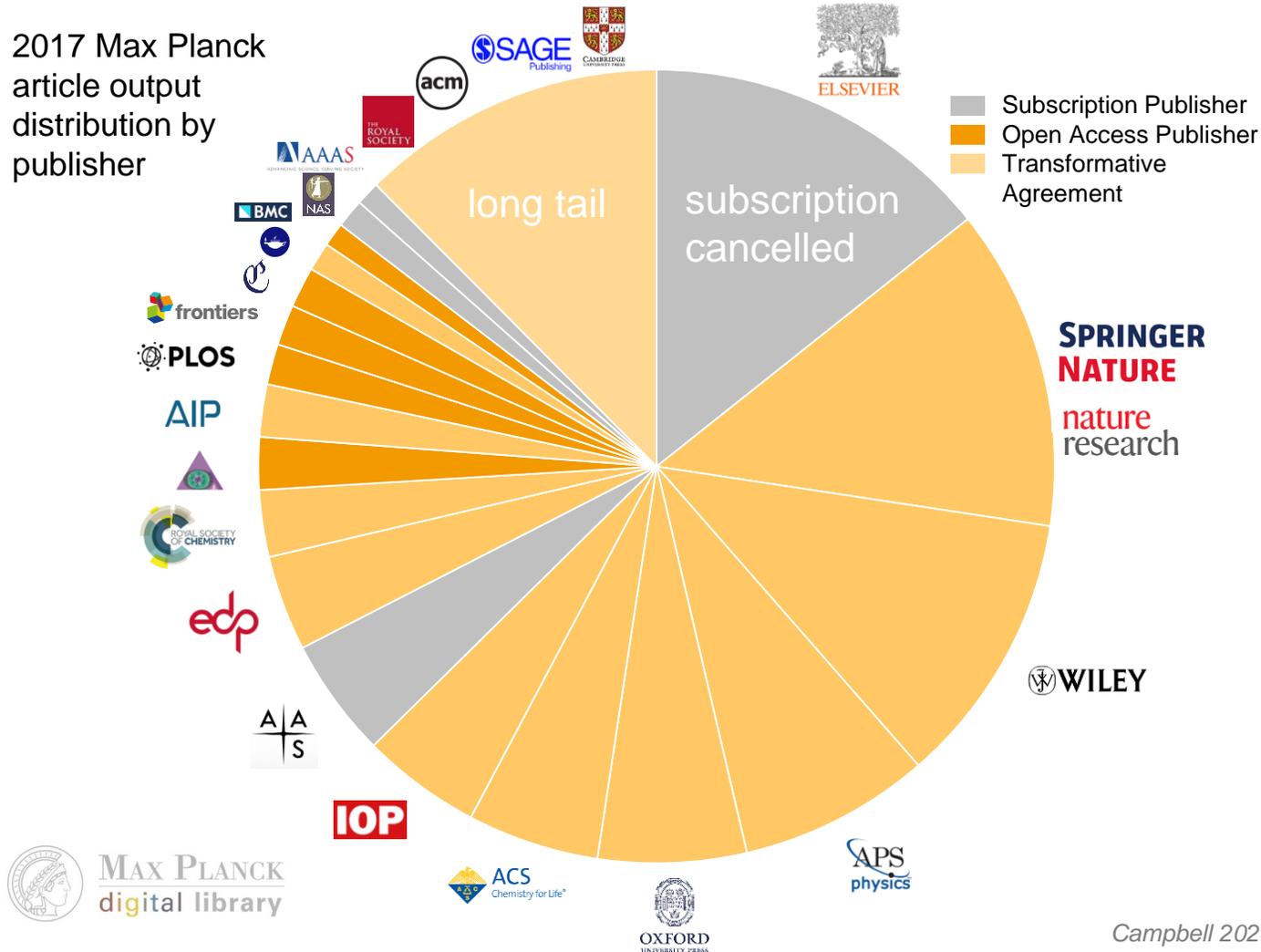
⇒ *both approaches are complementary, needed & successful*

# OA Transformation in Germany: MPG & DEAL Consortium

**Goal:** enable open access for all papers from our authors & maintain access to others (PAR)

**Status:** ~80% open access to publications from MPG, similar developments at DEAL partners

2017 Max Planck article output distribution by publisher



## Transformative Agreements (PAR):

~20 publishers provide open access for ~80% of MPG output;

- similar developments for other DEAL partners & publishers (*Springer-Nature, Wiley ...*)

- *Elsevier*: MPG & DEAL partner contracts expired since 2017/2018, few complaints

Wiley and Springer Nature agreements will enable around 23,000 new articles a year to be published CC-BY and massively expand access for readers from ~700 institutions  
All costs collapsed into a PAR fee of €2750 per research article

- Lump-sums of subscriptions are disaggregated and costs attributed solely based on article output
- Funds follow authors, even those lacking grant funds (SSH)
- Payments are centralized, alleviating authors of administrative burden and enabling innovative cost allocation models

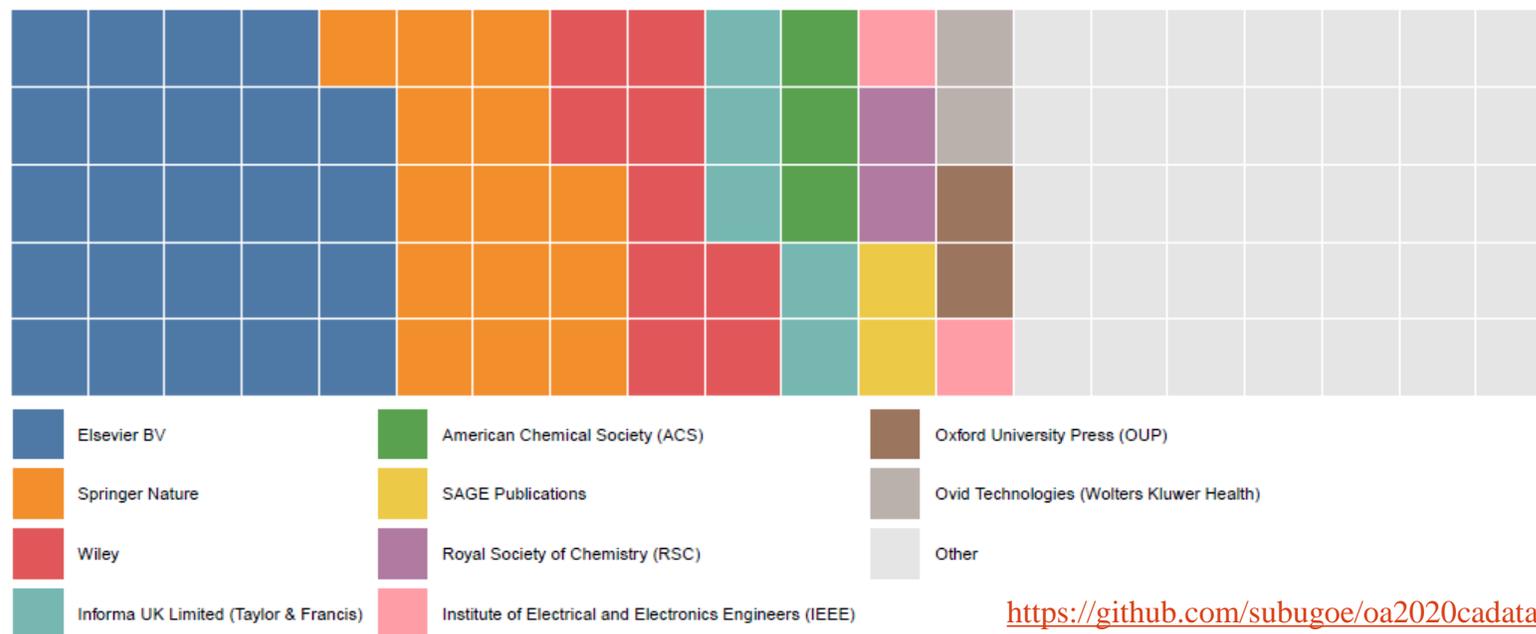
Lacking an offer that responds to DEAL's objectives for transformation, negotiations remain stalled with Elsevier, and the 200+ institutions that cancelled their contracts end 2017 and 2018 remain firm in their stance of non-renewal

*Hipler, H., Sander, F.: DEAL with it! Presentation at APE, Berlin, 2020.*

*Hipler, H.: Advances realized through Projekt DEAL's first Transformative Agreement, 2020.*

# Global Perspectives

Global Publisher Market Share indexed in the Web of Science between 2014–18



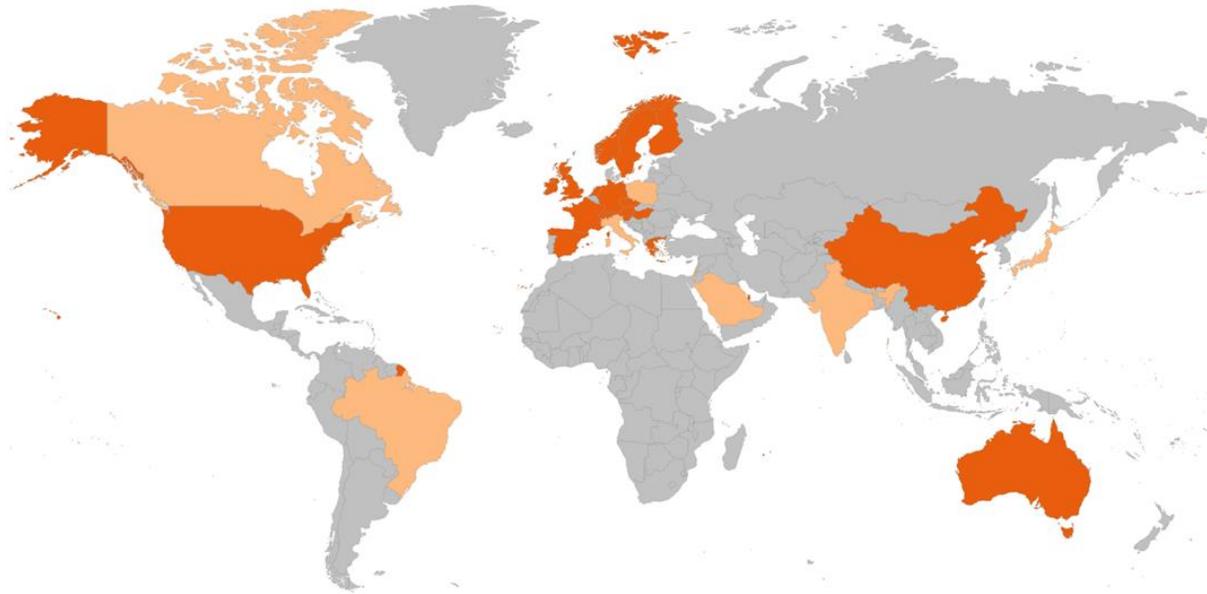
## Status 2018:

~8 billion EUR turnover; ~70% by 10 publishers; ~80% behind paywalls

## Perspectives 2020:

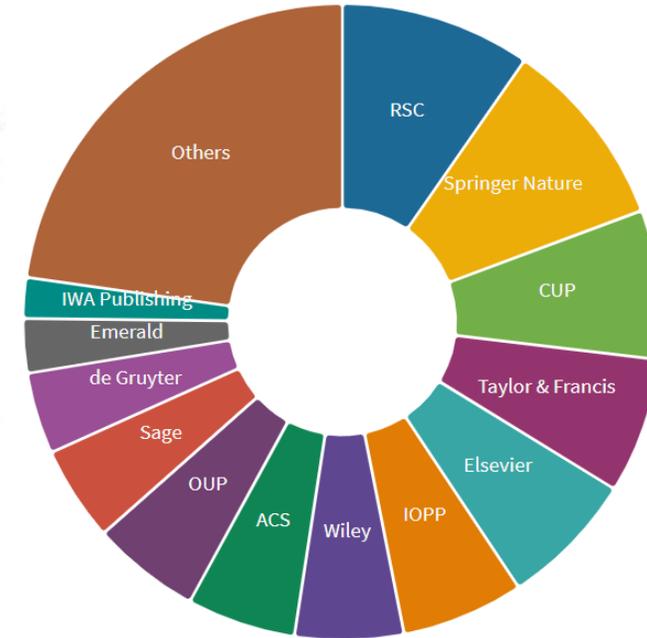
- many countries & organizations engaged in successful transformative activities (*see OA2020.org*)
- most publishers ready to offer transformative agreements (*“Publish & Read”*)
- Elsevier continues its “denial of service” in largest markets but starts to move in smaller markets

# Global Spread of Transformative Agreements



Pale orange: existing transformative agreements not yet in registry.

[esac-initiative.org/about/transformative-agreements/agreement-registry/](https://esac-initiative.org/about/transformative-agreements/agreement-registry/)



## ESAC Registry of Transformative Agreements:

~140 contracts in 20 countries with 33 publishers

⇒ OA to 90,000 journal articles published in 2020

⇒ major advances, but transition remains to be completed



Austria & FWF continue to be among successful pace makers for open access



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- Community-Driven Initiatives: Berlin/Bethesda/Budapest Conferences, OA2020
- Political & Funder Mandates: Plan S & cOAlition S, US WH-OSTP Policy

## Conclusions & Suggestions

- Explore new ways & transform subscriptions

# Vision for Open Access & Open Peer Review

*Promote societal progress through a global commons of scholarly information (**epistemic web**)*

## **Provide access to high quality scientific publications**

review & revision involving the community

⇒ *more & better information for scientists & society*

## **Document the scientific discourse**

public record of scientific evidence, arguments & progress

⇒ *universal & traceable web of knowledge (epistemic web)*

## **Demonstrate transparency & critical rationalism/realism**

transparent & rational approach to complex questions & problems

⇒ *role model for societal decision processes*

# Suggestions

## 1) Continue & promote experiments with improved forms of OA & OPR

- build on existing models & experience rather than re-inventing the wheel
- foster transparency & self-regulation (*multi-stage open peer review*)

## 2) Introduce & demand access to article reviews & pre-publication history

- establish new standards & proofs of quality assurance to cope with increase of scholarly articles & journals (*incl. predatory OA publishers*)

## 3) Advance & apply new metrics of publication impact & quality

- use article level metrics instead of journal impact factors
- use OA to terminate intransparent & unscholarly reliance on citation counting oligopoly (*WoS, Scopus, Google Scholar*)

## 4) Return control of scholarly publishing to scholarly community

- continue to support new & improved forms of OA publishing
- trust principles of mass & energy conservation: OA publishing costs can be covered by conversion of subscription budgets (*offsetting/transformation, cancelation ...*)
- proceed to large-scale implementation of OA & enhance diversity of publishing venues
- **stand united & discontinue inappropriate subscription contracts** (*Elsevier*)
- **endorse OA2020 Initiative for efficient & swift transition to OA** (*oa2020.org*)

