Open Access:
Scientific Quality Assurance by
Interactive Peer Review & Public Discussion

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Outline

Motivation

- *scientific publishing problems & open access perspectives*

Interactive Peer Review & Public Discussion

- *principles & effects*

Interactive Journal "*Atmospheric Chemistry and Physics*"

- *achievements & infrastructure*

Alternatives & Future Developments

- *key features & perspectives*

Vision & Suggestions

- *new standard of scientific quality assurance*

Motivation for Open Access

Scientific, economic & educational advantages of free online availability of scientific information

Educational:

- *information & stimulation for students & general public*
- *globally & socially equal opportunities in the information society*

Economic:

- *liberation of distorted scientific information market*
- *resolution of serial & budget crisis at university & research libraries*

Scientific:

- *enhancement of research impact & productivity*
- *improvement of quality assurance*
- *acceleration of scientific progress*

Open Access Conference Berlin 2003

Quality Assessment Working Group Statement

1. We expect that the transition to open access will **enhance the quality assurance and evaluation of scholarly output**. This will be a **direct consequence of the free availability of information**.
2. In disciplines where peer-review is a cornerstone of the scientific information system, open-access publishing has demonstrated the same standards as traditional publishing. We foresee that open access will allow the development of even **more effective peer-review by**
   - allowing **interactive forms of review and discussion**,
   - permitting **more efficient and more inclusive selection of referees**, and
   - giving **referees more information with which to do their work**.
3. Open access allows the development of **new forms of measurement of the quality and impact of scholarly work**. The globalization of scholarly activities requires a global assessment of their impact, which is only possible if there is free access to information. Measures that go beyond simple citation counting have already evolved in communities where open access is the rule.
4. In order to improve the quality of scholarly assessment, we urge funding organizations to require all scholarly output to be archived in an open-access environment and to support any costs associated with quality assessment and archiving for such environments.

I Baldwin, M Brammer, P Newmark, U Pöschl, B Schutz, C von der Lieth

Present Problems (I)

Large fraction of scientific publications careless, useless, or false

The "Tip of the Iceberg": scientific fraud

- *falsification, selective omission & tuning of results,*
- *e.g. Schön et al., Nature, 422, 92-93, 2003; 421, 419-421, 2002*

The "Norm": scientific carelessness

- *superficial & irreproducible description of experiments & models*
- *non-traceable arguments & conclusions, duplicate & split papers, etc.*

The Consequences: waste & misallocation of resources

- *costly reconstruction of poorly described methods & results*
- *propagation of errors & misinterpretations, misevaluation of projects & scientists (publication numbers vs. quality), etc.*

Present Problems (II)

Traditional journals & peer review fail to provide efficient scientific exchange & quality assurance

Editors & Referees: limited competence & conflicting interests

- *few editors for large subject areas*
  - $\Rightarrow$ *limited knowledge of scientific details & specialist referees*
- *work overload, conflicting interests & little gain for referees*
  - $\Rightarrow$ *superficial or prejudiced review & evaluation*

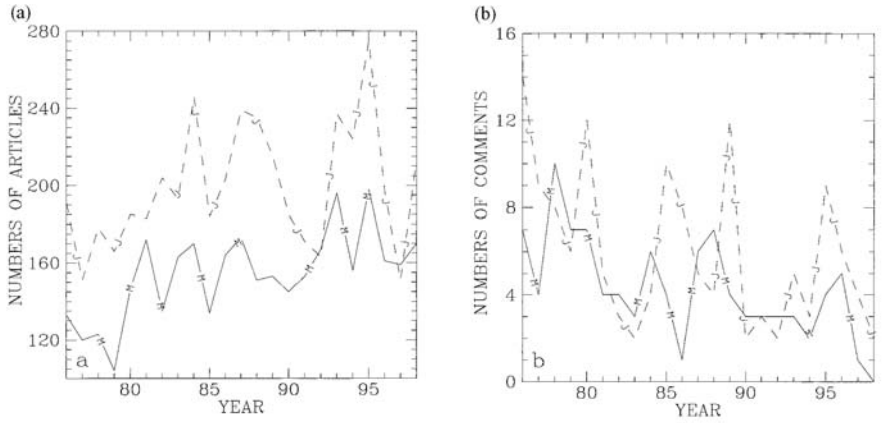
Closed Peer Review: retardation & loss of information

- *publication delays, watering down of messages, plagiarism*
- *critical, supportive & complementary comments unpublished*

Traditional Discussion: sparse & late commentaries

- *labor-intensive, delayed & watered-down by peer review*

Present Problems (III)



Increase of articles & decrease of comments in traditional journals

Number of articles (a) and comments (b) published in Monthly Weather Review (solid) and Journal of Atmospheric Sciences (dashed) within the indicated year.

Comment / Article Ratio (1978 ⇒ 1998): **1 / 20 ⇒ 1 / 100**

Errico, Bull. Amer. Met. Soc., 81, 1333-1337, 2000

Dilemma

Two conflicting needs of scientific publishing: rapid publication vs. thorough review & discussion

Rapid Publication: widely pursued

- *required for efficient exchange of new findings & open questions*
- *traditional journals push for short peer review times (2-4 weeks) & prefer short papers with little detailed information*
- *preprints & proceedings with no or little quality assurance flood the information market*

Thorough Review & Discussion: widely neglected

- *required to identify scientific flaws, useless research & duplications*
- *rarely possible by a couple of referees within 2-4 weeks*
- *frequently ignored for spectacular high-impact publications*
- *uncritical trust of publications in journals with high statistical impact factors*

Solution

Two-stage publication process with interactive peer review & public discussion

Stage 1: Rapid publication of Discussion Paper

pre-selected by editors (referees), fully citable & permanently archived (more than traditional preprint)

Interactive Peer Review & Public Discussion

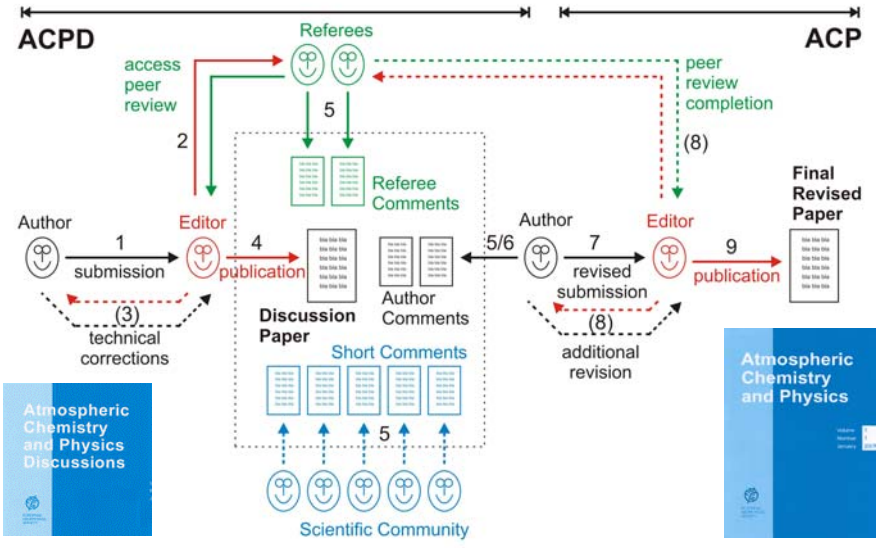
referee comments & additional comments by interested colleagues published alongside the discussion paper (anonymous or attributed, non-reviewed but individually citable & permanently archived)

Stage 2: Review completion & publication of Final Revised Paper

analogous to traditional peer review & journal publication

Interactive Scientific Journal

Discussion Forum *(stage1)* + Journal *(stage 2)*



Primary Effects & Advantages

All-win situation for authors, referees & readers

Discussion Paper

- *free speech & rapid publication (authors & readers)*

Interactive Peer Review & Public Discussion

- *direct feedback & public recognition for high quality papers (authors)*
- *prevention of hidden obstruction & plagiarism (authors)*
- *documentation of critical comments, controversial arguments, scientific flaws & complementary information (referees & readers)*
- *deterrence of careless, useless & false papers (referees & readers)*

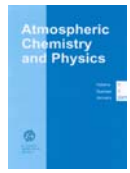
Final Revised Paper

- ***maximum quality assurance & information density*** *through complete peer review, public discussion & final revision* ***(readers)***

Atmospheric Chemistry & Physics (ACP)

Publisher & Distribution

- *European Geosciences Union (EGU)*
- ***free internet access*** *(www.atmos-chem-phys.org) paper copies & CDs printed & sold on demand*



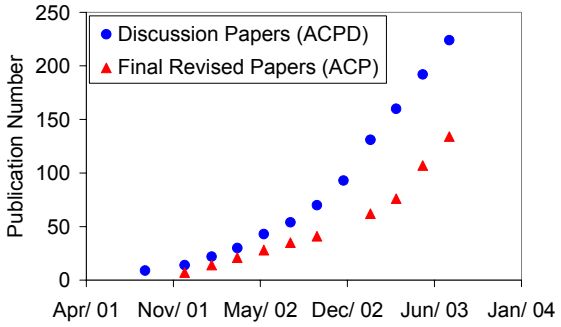
Editors

- *globally distributed network of* ***~ 70 editors covering 32 major subject areas***
- *coordination by executive committee & chief executive editor*

Publication Market

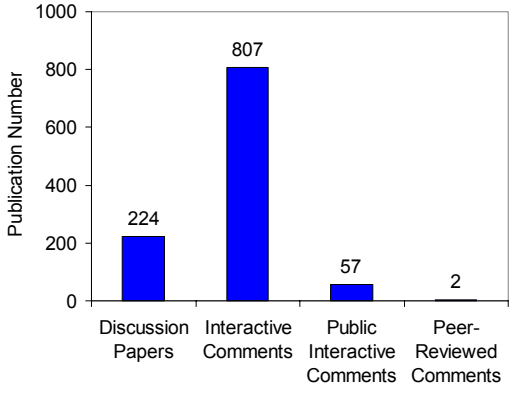
- ***~ 40 traditional journals*** *publishing* ***~ 4000 atmospheric science papers/yr***
- *major competitors:* *J. Geophys. Res. - Atmos. (AGU, ~1000 papers/yr)*
  Atmos. Environ. (Elsevier, ~500 papers/yr)
  Atmos. Res. (Elsevier, ~100 papers/yr)
  J. Aerosol Sci. (Elsevier, ~100 papers/yr), etc.
- *ACP launch:* *September 2001*
- *status after 2 years:* ***> 150 papers/yr****, positive evaluation & full coverage by* ***ISI & CAS citation indices***

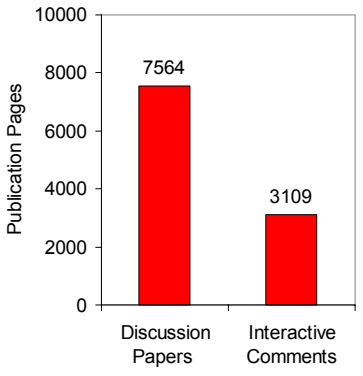
ACP Publication Statistics



- ***submission rate (increasing):*** ***~ 20 month^{-1}***
- ***rejection rate in access peer review (ACPD):*** ***~ 20 %***
- ***rejection rate in peer review completion (ACP):*** ***~ 10 %***
- ***time from submission to publication in ACPD:*** ***1-2 months***
- ***time from submission to publication in ACP:*** ***4-6 months***

ACP Discussion Statistics





- ***interactive comments / article:*** ***~ 4***
- ***comment pages / article page:*** ***~ 1/3***
- ***public interactive comments / article:*** ***~ 1/4***
- ***(traditional) peer-reviewed comments / article:*** ***~ 1/100***
- *increase with visibility & publication alert service expected*

ACP Discussion Example (I)

Atmospheric Chemistry and Physics Discussions (ACPD): Interactive Discussion

Discussion Paper

Publication Date	*Title, Authors, Reference*	*Online Access*
01.07.2003	**Comment on evidence for surface-initiated homogenous nucleation** J. E. Kay, V. Tsemekhman, B. Larson, M. Baker, and B. Swanson *Atmos. Chem. Phys. Discuss.*, 3, 3361-3372, 2003	Abstract (HTML, 3 KB) Full Text Online Version (PDF, 311 KB) Full Text Print Version (PDF, 222 KB) Final Revised Version (ACP)

Interactive Discussion

Status: Closed

RC S1124 : 'Referee Comment on Kay et al.' , Anonymous Referee #2, 28.07.2003, 19:06
└**AC** S1176 : 'Response to Anonymous Referee #2' , Jennifer Kay, 05.08.2003, 20:05

RC S1126 : 'Referee comment on Kay et al.' , Paul DeMott, 28.07.2003, 22:59
└**AC** S1201 : 'Author response to referee Pa...' , Jennifer Kay, 07.08.2003, 10:02

SC S1134 : 'Comment on Kay et al. paper' , Azadeh Tabazadeh, 29.07.2003, 21:33
└**AC** S1374 : 'Author Response to Tabazadeh ...' , Jennifer Kay, 24.08.2003, 20:21
└**SC** S1393 : 'Reply to Kay et al.' , Azadeh Tabazadeh, 26.08.2003, 18:11
└**AC** S1507 : 'Author Response to A. T...' , Jennifer Kay, 12.09.2003, 0:41

RC S1407 : 'review of Kay et al' , Anonymous Referee #1, 28.08.2003, 9:46
└**AC** S1504 : 'Response to Anonymous Referee #1' , Jennifer Kay, 11.09.2003, 23:53

AC: Author Comment (on behalf of all co-authors)
RC: Referee Comment (anonymous or attributed)
SC: Short Comment (attributed)
Online Version (PDF)
Print Version (PDF)

ACP Discussion Example (II)

Atmospheric Chemistry and Physics Discussions (ACPD): Interactive Discussion

Discussion Paper

Publication Date	*Title, Authors, Reference*	*Online Access*
30.08.2002	**Modelling of the photooxidation of Toluene: conceptual ideas for validating detailed mechanisms** V. Wagner, M. E. Jenkin, S. M. Saunders, J. Stanton, K. Wirtz, and M. J.Pilling *Atmos. Chem. Phys. Discuss.*, 2, 1217-1259, 2002	Abstract (HTML, 4 KB) Full Text Online Version (PDF, 763 KB) Full Text Print Version (PDF, 563 KB) Final Revised Version (ACP)

Interactive Discussion

Status: Closed

RC S391 : 'Referee comments' , Anonymous Referee #3, 11.09.2002, 16:07
└**AC** S657 : 'Final Response to Referee #3' , Volker Wagner, 23.11.2002, 20:04

RC S394 : 'Referee Comments' , Anonymous Referee #1, 12.09.2002, 11:22
└**AC** S662 : 'Final Response to Referee #1' , Volker Wagner, 24.11.2002, 15:00

RC S472 : 'Referee Comments' , Anonymous Referee #2, 10.10.2002, 11:33
└**AC** S673 : 'Final Response to Referee #2' , Volker Wagner, 24.11.2002, 19:41

SC S530 : 'New reaction to be included' , Friedhalm Zabel, 23.10.2002, 17:10
└**AC** S637 : 'Author response to comment by...' , Volker Wagner, 19.11.2002, 13:03

AC: Author Comment (on behalf of all co-authors)
RC: Referee Comment (anonymous or attributed)
SC: Short Comment (attributed)
Online Version (PDF)
Print Version (PDF)

ACP Interactive Comments (I)

- ***mix of constructive contributions, harsh critcism & applause***
- ***referees preferring anonymity: ~ 70 %***

  (experimentalists: ~ 90 %, modellers: ~ 50 %)

Examples for constructive contributions & applause

- **Public Comment** (ACPD, 2, S530-S532, 2002):

  *… the following comment **does not affect the aim of the paper** …*
  *however, it **might be of general interest** for all those modelling …*
  *I would like to **suggest that … be included**.*

- **Public Comment** (ACPD, 3, S1107–S1108, 2003):

  *Investigating thoroughly the effects of … **was something that really needed to be done, so a bouquet to the authors for doing it.***
  *My comment is that it also **necessitates an extension** …*

ACP Interactive Comments (II)

Examples for harsh criticism & controversy

- **Referee Comment** (ACPD, 3, S448-S451, 2003):

  *This is by no means possible, … I am really frustrated about the fact that the authors … **already published a large number of papers in which they state again and again …***

  *The authors permanently **ignore all the state-of-the-art papers** regarding the ill-posed problems associated with …*
  *So, most of the … results presented here are **just speculation**.*

- **Author Response** (ACPD, 3, S912-S918, 2003):

  *The reviewer does **not indicate any of these "state of the art papers".***
  *The comments just made above perfectly fit to this **reiterated opinion** …*
  *This manuscript confirms once again the existence of such correlations and shows the **actual retrieval uncertainties to be even smaller***

No abusive commenting or personal offenses

ACP Key Features & Effects

Combination of multiple features for maximum efficiency of scientific exchange & quality assurance

Publication of discussion paper before full review & revision

- ⇒ *rapid publication, **free speech & public accountability** of authors*
- ⇒ *fewer careless submissions by authors relying on referee support*

Interactive peer review & public discussion

- ⇒ *public comments support peer review, revision & editorial decision*
- ⇒ *maximum **quality assurance & information density***

Optional anonymity for referees (not for other commentators)

- ⇒ *critical comments from competent but **dependent or busy referees***

Archiving & citability of all discussion papers & comments

- ⇒ *documentation of **controversial scientific innovations & flaws** in papers reviewed & commented but finally rejected*

ACP Follow-Ups & Infrastructure

New Interactive Scientific Journals

- ***Biogeosciences (BG) & Biogeosciences Discussions (BGD)** since 03/2004: www.biogeosciences.net*
- *Climate & Hydrology journals in preparation*
- ***Publisher: Copernicus Society,** www.copernicus.org on behalf of various scientific societies (EGU/EGS, URSI, AEF, etc.); service charges: ~ 20 EUR/Page (to be decreased) digital printing on demand: ~ 60 EUR/Issue*

Central Online & Open Access Library (COOL)

- *internet platform for scientific open access publications with advanced **search, alert & referencing services***
- *open to all scientific societies & organisations, www.sref.org/cool*

Society Reference Catalogue (SRef)

- *scientific internet referencing & document identification system*
- ***non-profit & advanced alternative** to commercial **Digital Object Identifier (DOI)** system, www.sref.org/site*

Discussion Paper Layout: Online

Atmos. Chem. Phys. Discuss., 4, 1665–1689, 2004
www.atmos-chem-phys.org/acpd/4/1665/
SRef-ID: 1680-7375/acpd/2004-4-1665

Atmospheric Chemistry and Physics Discussions

Highly resolved global distribution of tropospheric NO_2 using GOME narrow swath mode data

S. Beirle[1], U. Platt[1], M. Wenig[2], and T. Wagner[1]

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Received: 20 January 2004 – Accepted: 16 February 2004 – Published: 16 March 2004

Correspondence to: S. Beirle (beirle@iup.uni-heidelberg.de)

Discussion Paper Layout: Print

Atmos. Chem. Phys. Discuss., 4, 1665–1689, 2004
www.atmos-chem-phys.org/acpd/4/1665/
SRef-ID: 1680-7375/acpd/2004-4-1665
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Abstract

The Global Ozone Monitoring Experiment (GOME, since 1995) allows the retrieval of global total column densities of atmospheric trace gases, including NO_2. Tropospheric vertical column densities (VCDs) are derived by estimating the stratospheric fraction from measurements over the remote ocean. Mean maps of tropospheric NO_2 VCDs derived from GOME clearly allow to detect regions with enhanced industrial activity, but the standard spatial resolution of the GOME ground pixels (320×40 km²) is insufficient to resolve regional trace gas distributions or individual cities.

Within the nominal GOME operation, every tenth day measurements in the so called narrow swath mode are executed with a much better spatial resolution (80×40 km²). Though the global coverage of these data is – due to the narrow swath – rather poor, the mean distribution over several years (1997–2001) allows to construct a much more detailed picture of the global NO_2 distribution, especially if corrected for seasonal effects. It vividly illustrates the shortcomings of the standard size GOME pixels and reveals an unprecedented wealth of details in the global distribution of tropospheric NO_2. Sharply localised spots of enhanced NO_2 VCD can be associated directly to cities, large power plants, and heavy industry-centers.

The long time series of GOME data allows a quantitative comparison of the narrow swath mode data to the nominal resolution that holds general information on the dependency of NO_2 VCDs on pixel size. This is important for new instruments like SCIAMACHY (launched March 2002 on ENVISAT) or OMI and GOME II (to be launched 2004 and 2005, respectively) with an improved spatial resolution.

1 Introduction

The atmospheric composition has changed dramatically over the last 150 years due to the industrial revolution. Among the various emitted pollutants nitrogen oxides ($NO+NO_2=NO_x$ and reservoirs) play an important role. In the troposphere they have

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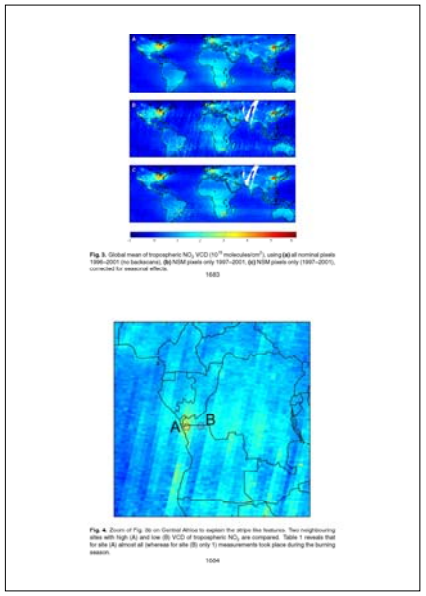


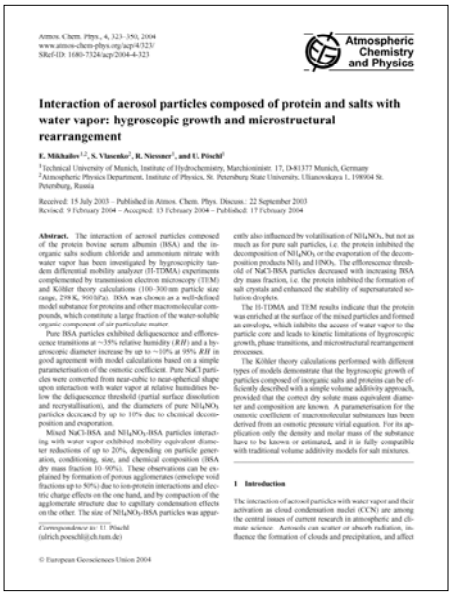
Fig. 3. Global mean of tropospheric NO_2 VCD (10^{15} molecules/cm²), using (a) all nominal pixels 1996–2001 (no backscans), (b) NSM pixels only 1997–2001, (c) NSM pixels only (1997–2001), corrected for seasonal effects.

1683

Fig. 4. Zoom of Fig. 3b on Central Africa to explain the stripe like features. Two neighbouring sites with high (A) and low (B) VCD of tropospheric NO_2 are compared. Table 1 reveals that for site (A) almost all (whereas for site (B) only 1) measurements took place during the burning season.

1684

Final Revised Paper Layout



Atmos. Chem. Phys., 4, 323–350, 2004
www.atmos-chem-phys.org/acp/4/323/
SRef-ID: 1680-7324/acp/2004-4-323

Atmospheric Chemistry and Physics

Interaction of aerosol particles composed of protein and salts with water vapor: hygroscopic growth and microstructural rearrangement

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Abstract. The interaction of aerosol particles composed of the protein bovine serum albumin (BSA) and the inorganic salts sodium chloride and ammonium nitrate with water vapor has been investigated by hygroscopicity tandem differential mobility analyzer (H-TDMA) experiments complemented by transmission electron microscopy (TEM) and Köhler theory calculations (100–300 nm particle size range, 298 K, 80(0)% RH). BSA was chosen as a well-defined model substance for proteins and other macromolecular compounds, which constitute a large fraction of the water-soluble *organic component of air particulate matter*.

Pure BSA particles exhibited deliquescence and efflorescence transitions at ~35% relative humidity (*RH*) and a hygroscopic diameter increase by up to ~10% at 95% *RH* in good agreement with model calculations based on a simple parameterisation of the osmotic coefficient. Pure NaCl particles were converted from near-cubic to near-spherical shape upon interaction with water vapor at relative humidities below the deliquescence threshold (partial surface dissolution and recrystallisation), and the diameters of pure NH_4NO_3 particles decreased by up to 10% due to chemical decomposition and evaporation.

Mixed NaCl-BSA and NH_4NO_3-BSA particles interacting with water vapor exhibited mobility equivalent diameter reductions of up to 20%, depending on particle generation, conditioning, size, and chemical composition (BSA dry mass fraction 10–90%). These observations can be explained by formation of porous agglomerates (envelope void fractions up to 80%) due to ion-protein interactions and electric charge effects on the one hand, and by compaction of the agglomerate structure due to capillary condensation effects on the other. The size of NH_4NO_3-BSA particles was appar-

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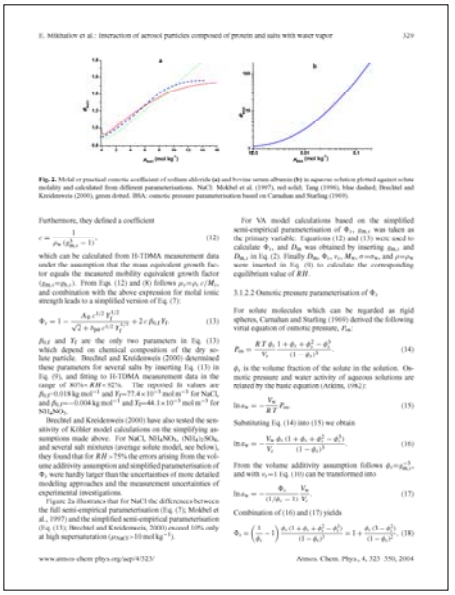
ently also influenced by volatilisation of NH_4NO_3, but not as much as for pure salt particles, i.e. the protein inhibited the decomposition of NH_4NO_3 or the evaporation of the decomposition products NH_3 and HNO_3. The efflorescence threshold of NaCl-BSA particles decreased with increasing BSA dry mass fraction, i.e. the protein inhibited the formation of salt crystals and enhanced the stability of supersaturated solution droplets.

The H-TDMA and TEM results indicate that the protein was enriched at the surface of the mixed particles and formed an envelope, which inhibits the access of water vapor to the particle core and leads to kinetic limitations of hygroscopic growth, phase transitions, and microstructural rearrangement processes.

The Köhler theory calculations performed with different types of models demonstrate that the hygroscopic growth of particles composed of inorganic salts and proteins can be efficiently described with a simple volume additivity approach, provided that the correct dry solute mass equivalent diameter and composition are known. A parameterisation for the osmotic coefficient of macromolecular substances has been derived from an osmotic pressure virial equation. For its application only the density and molar mass of the substance have to be known or estimated, and it is fully compatible with traditional volume additivity models for salt mixtures.

1 Introduction

The interaction of aerosol particles with water vapor and their activation as cloud condensation nuclei (CCN) are among the central issues of current research in atmospheric and climate science. Aerosols can scatter or absorb radiation, influence the formation of clouds and precipitation, and affect



Alternative Approaches

Interactive journal with initial "private peer review"

- *e.g. Journal of Interactive Media in Education (JIME)*
- *missing documentation of* ***controversial scientific innovations & flaws*** *in papers rejected after "private peer review"*

Traditional journal with "pre-publication history" & "peer commentary"

- *e.g. BioMed Central Medicine Journals (BMC)*
  Behavioral & Brain Sciences (BBS)
- *missing documentation of* ***controversial scientific innovations & flaws*** *in papers rejected after peer review*
- *no public contribution to peer review, revision & editorial decision*
  ⇒ sub-optimal ***quality assurance & information density***

Traditional preprint server & traditional journal

- *e.g. arXiv.org*
- *no public refereeing*
  ⇒ sub-optimal ***quality assurance & information density***

Future Developments

Flexible adaptation & complementation of interactive peer review & public discussion

Adjustment of pre-selection & discussion period

extent of referee involvement & technical corrections

Statistical rating of individual papers

download, commenting & citation statistics

Section for final revised papers with low editorial rating

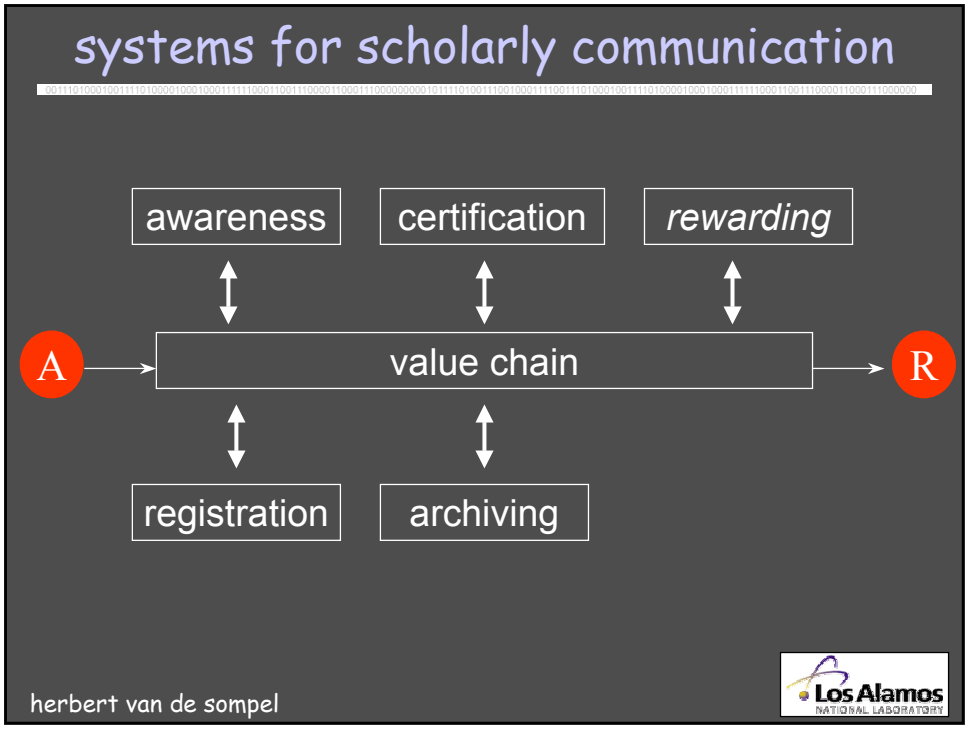
final revised papers not accepted for publication in main journal
(e.g. ACP Contributions, ACPC); multi-level economics journals (bepress)

Quality assurance feedback loop

editorial rating (ACP/ACPC) vs. statistical rating of papers (discussion/final)

Integration in large-scale open access publishing systems

evolutionary non-disruptive transition to peer networks (H. v. de Sompel et al.)



disaggregated system: how?

- registration: authors via discipline-specific eprint servers, institutional repositories, peer-to-peer research repositories, …**open access preprints**
- other functions:
  - value-added services that provide certification, awareness, archiving, and rewarding functions
  - current agents of these functions (e.g., societies) can operate in disaggregated model
  - new entrants in the system possible
  - various business models possible

herbert van de sompel

Los Alamos NATIONAL LABORATORY

The Innovator's Dilemma {Christensen}

- sustaining versus disruptive technologies;
- disruptive technologies:
  - somehow perform worse than established ones
  - not accepted by core customer base
  - but: convenient, cheap, …
- disruptive technologies can create competition in an existing value network by creating a new one first.

=> **open access preprints** as a disruptive technology

Open access discussion papers & interactive journals: non-disruptive innovation technology

Styles of Assessment in future

- **Community assessment**
  - Commentaries
  - Review articles
  - Citation analyses (big possibilities in open-access)
- **Organized analysis**
  - Journal peer-review

Slower, more accurate in long-term

Immediate but cruder

Both systems may co-exist: address different needs

Bernard F Schutz
Albert Einstein Institute

Realisation: peer review & public discussion in interactive journals

Prestigious journals become assessment houses

1. Author self-archives, sends URL to *Journal of Outstanding Research* (JOR)
2. JOR assesses as today, requests changes, eventually accepts article (insisting on uniqueness)
3. Author pays fee to JOR, moves revised version to an archive library site, attaches JOR seal-of-approval glyph/link to final article (glyph owned/protected by JOR)
4. JOR publishes a list of approved articles on its website, links to author's article URL
5. JOR's charge is a fair charge, allows a profit. Maybe negotiated with funding providers: NSF, MPG, … . Charge scale could also allow for a proportion of zero-charge articles.

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Realisation: disaggregated interactive journal

Vision

Promotion of scientific progress by general introduction of interactive peer review & public discussion

Revaluation & higher information density of scientific literature

interactive 2-stage process of peer review, publication & discussion ⇒ more attention & carefulness of authors, more input from referees & other scientists into review & revision ⇒ ***better & fewer papers***

Better documentation & evaluation of scientific quality & competence

interactive peer-review & public discussion ⇒ more information about scientific quality, competence & style of papers & authors ⇒ facilitate evaluation by ***non-specialist readers & evaluation committees*** *(funding & positions)*

Faster scientific innovation & disclosure of scientific flaws

publication of discussion papers before full peer review ⇒
free speech & documentation of controversial scientific innovations & flaws

Pöschl, Learned Publishing, 2004

Suggestions

Promote open access publishing to improve quality assurance

- *self-archiving not sufficient*

Complement peer review by interactive public discussion

- *discussion forum* ***easy to add in new & traditional journals***
- *preprints ⇒ discussion papers (discussion documents)*

Foster evaluation of scientists & projects by individual papers

- *encourage evaluation committees to complement publication counts by a look into* ***interactively discussed papers***
- *weight statistical evaluation parameters (e.g. citation frequency) by* ***quality assurance factors*** *(no < closed < interactive peer review)*

Establish interactive peer review & public discussion as new standard of scientific quality assurance & evaluation

- *replace closed peer review*

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