Review on 5 Years DataCite and 10 Years DOI Registration for Data

DataCite Annual Conference 2014

Nancy, August 25th – 26th

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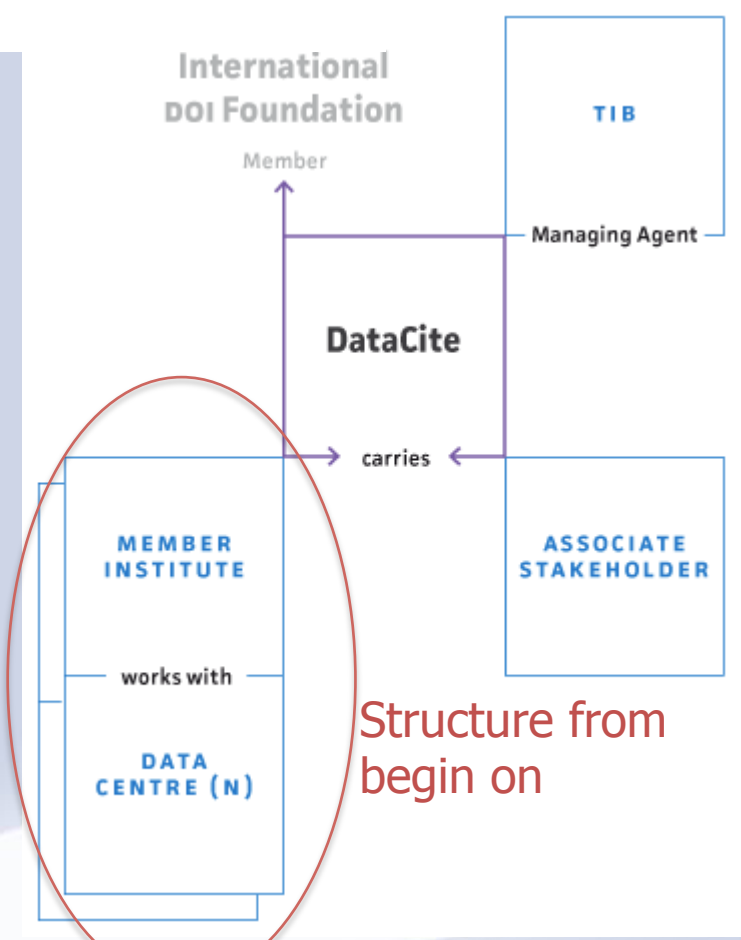
(DKRZ – German Climate Computing Centre, Hamburg)

DataCite

Helping you to find, access, and reuse data

Content

- DataCite:
  - 5 years in a nutshell
- Towards DataCite:
  - Development before 2009
- DataCite in Climate Research:
  - Long-term Archiving at WDCC/DKRZ



DataCite in a Nutshell

- founded in December 2009 by 7 members from 6 countries and started with the TIB handle server containing about 600,000 scientific data STD-DOIs.
- enfosters citation of scientifc data, data citation can help by
  - enabling easy reuse and verification of data
  - allowing the impact of data to be tracked
  - creating a scholarly structure that recognises and rewards data producers
- Member development
  - 2010: 15 members from 10 countries
  - 2014: 22 full members and 9 associated members from 19 countries
- DOI development
  - 2010: 1 Mio
  - August 2014: 3.5 Mio (expecting more than 4 Mio by end of 2014)
- More details: https://www.datacite.org

DataCite Evolution in 5 Steps

- (1998) – 2000: Basic Ideas
  - In the last quarter of 2000 the evolution towards DataCite started.
  - Continuous funding of the development by DFG

DFG funded development projects

- 2001 – 2002: Concept and Implementation Plan
- 2003 – 2005: Pilot Implementation
  - 2004: Start of STD-DOI Handle Server at TIB, Hannover
- 2006 – 2009: STD-DOI Data Publication as a Service

- 2009 – 2014: DataCite
  - 2012: Shut down of STD-DOI Handle Server at TIB and final transition to DataCite Handle Server(s)

DataCite Evolution (i)

- (1998) – 2000: Basic Ideas
  - Mundt (1998): term paper at Uni. Potsdam / GFZ entitled “Der DOI (digital object identifier) ein verlagsorientiertes Indexierungswerkzeug auch anwendbar auf Datensätze?“
  - Oct. 2000: 17th International CODATA Conference (Committee on Data for Science and Technology): discussion of basic ideas for scientific data publication by Michael Lautenschlager (DKRZ) and Joachim Wächter (GFZ)
  - Nov. 2000: presentation of a concept paper „Publikation und Zertifizierung von wissenschaftlichen Daten“ by and M.L. and J.W. at the regular meeting of the CODATA national committee and discussion with DFG (S. Eckelmann) about funding opportunities
  - End of 2000: decision of DFG to fund a CODATA Working Group to discuss between liberians and scientists the concept of scientific data publication and come up with an implementation plan

Mundt (1998)

Michaela Mundt 02.10.1998

Weiterbildung zur Wissenschaftlichen Dokumentarin
Feldseminar im Daten- und Rechenzentrum des Geoforschungszentrums Potsdam
20. Juli-2. Oktober 1998

Der DOI (digital object identifier)
ein verlagsorientiertes Indexierungswerkzeug auch anwendbar auf Datensätze?

Internetstudie zur möglichen Anwendbarkeit des DOI
für die im ICDP-Clearinghouse angebotenen Daten

E

17th International CODATA Conference (2000)

Tischvorlage CODATA Landesausschußsitzung
29.11.00 in Bonn:

Publikation und Zertifizierung von wissenschaftlichen Daten

Michael Lautenschlager (MPIM/M&D)
Joachim Wächter (GFZ)

Der Fortschritt der modernen wissenschaftlichen Forschung geht mit einem enormen Gewinn an Daten einher. Die einzelnen Disziplinen, z.B. Biologie oder die Geowissenschaften sind dabei dieses Problem zu betrachten. Von zentraler Bedeutung sind wissenschaftliche Netzwerke, mit denen die Ergebung, das Verfügbarmachen, sowie die Integration und Nutzung der großen, heterogenen, interdiziplinären Datenmengen unterstützt wird.

Concept Paper

(Nov. 2000)

DataCite Evolution (ii)

- 2001 – 2002: Concept and Implementation Plan
  - Begin of 2001: Foundation of CODATA working group "Possibility of Citing Scientific Primary Data"
  - Composition of WG: 50% liberians and 50% scientists (request of DFG as funding agency)
  - Members: Carola Kauhs (MPI-M, Hamburg), Dr. Michael Lautenschlager (Speaker, MPI-M/DKRZ, Hamburg), Dr. Manfred Reinke (AWI, Bremerhaven), Prof. Dr. Gerhard Schneider (Uni. Freibug), Dr. Irina Sens (TIB, Hannover), Dr. Uwe Ulbrich (Uni. Cologne), Dr. Joachim Wächter (GFZ, Potsdam)
  - Funding period: 2 years funding from DFG
  - Final Report: "Conception of citing scientific primary data" (May 29th, 2002)
  - Presentation of results: March 2002 to Library Committee of DFG
    - Conditional funding recommendation with geoscience as pilot community but with URNs as second persistent identifier beside DOIs and with contemporary reporting to DFG

Conception of citing scientific primary data

Final Report

CODATA AG "Possibility of citing scientific primary data"

(May 29th, 2002)

Participants:

Carola Kauhs
(Head of Library, Max Planck Institute for Meteorology, Hamburg)

Dr. Michael Lautenschlager
(Speaker of the Working Gr
Group, Max-Planck Institut

Dr. Manfred Reinke
(Scientific Information Syst
Marine Research, Bremerha

Prof. Dr. Gerhard Schneider
(Head of Computer Center,

Dr. Irina Sens
(Director's Representative,
Information Library)

Dr. Uwe Ulbrich
(Institute for Geophysics an

Dr. Joachim Wächter
(Head of Data and Computer Center, GeoForschungZentrum Potsdam)

Guiding Principle:
Analogy to scientific literature as close as possible, which means scientific data are irrevocable after publication and have a suitable granularity.

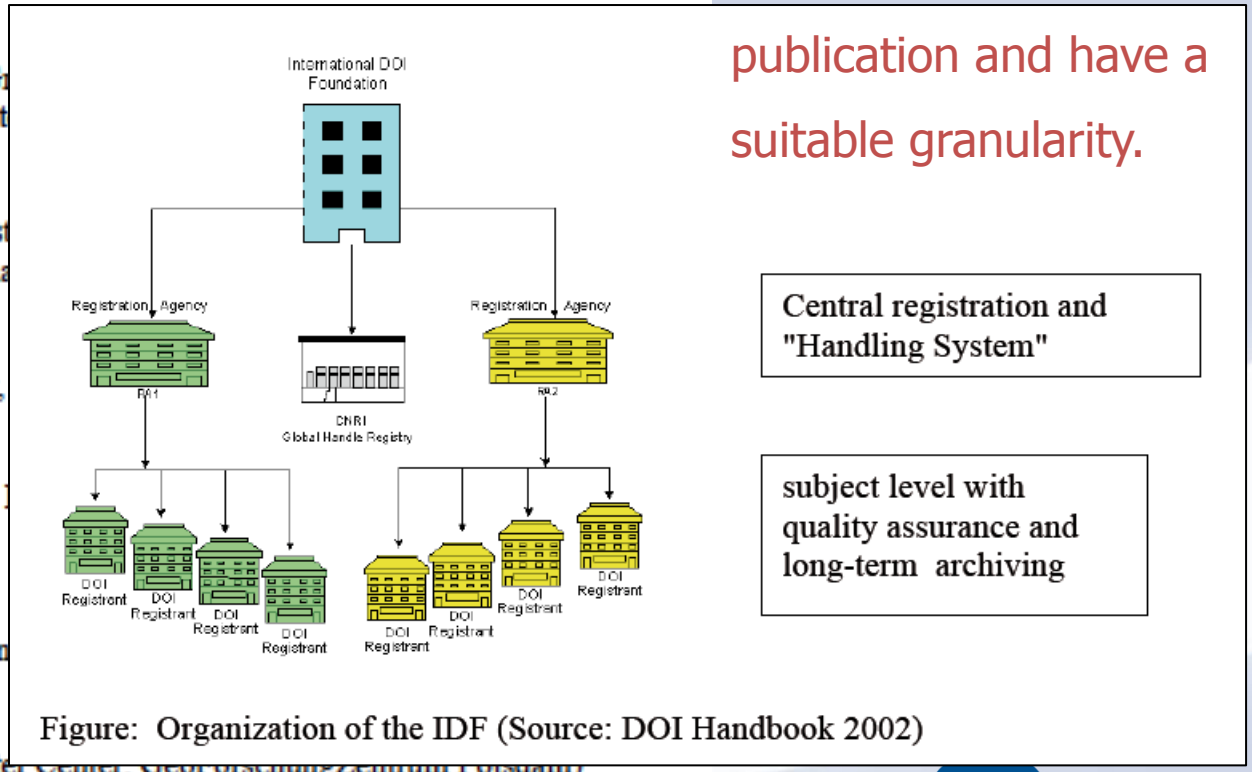


Figure: Organization of the IDF (Source: DOI Handbook 2002)

DKRZ

DataCite Evolution (iii)

- 2003 – 2005: Pilot Implementation
  - Project: 2 years funded by DFG
    - Partners: TIB and 3 data archives, WDCC/DKRZ (coordination), WDC Mare, GFZ Potsdam
  - Focus: Scientific reference data which are ready be used in scientific literature (final research data products)
  - Concept: quality controlled scientific data are classified as irrevocable and are registered together with DOI (URN) and citation reference in a CNRI Handle Server and in library catalogues in order …
    - To allow for transparent data access
    - To foster verification of scientific results
    - To allow for data citation in scientific literature
    - To give credit to data authors
  - STD-DOI metadata (STD - Scientific and Technical Data): DOI kernel includes Dublin Core and ISO 690 in order to integrate metadata for electronic publication, cross-disciplinary usability
  - Problem: definition of data granularity across disciplines which is suitable for citation in scientific literature
  - 2004: Start of STD-DOI Handle Server at TIB, Hannover

2004: Start of STD-DOI Handle Server at TIB

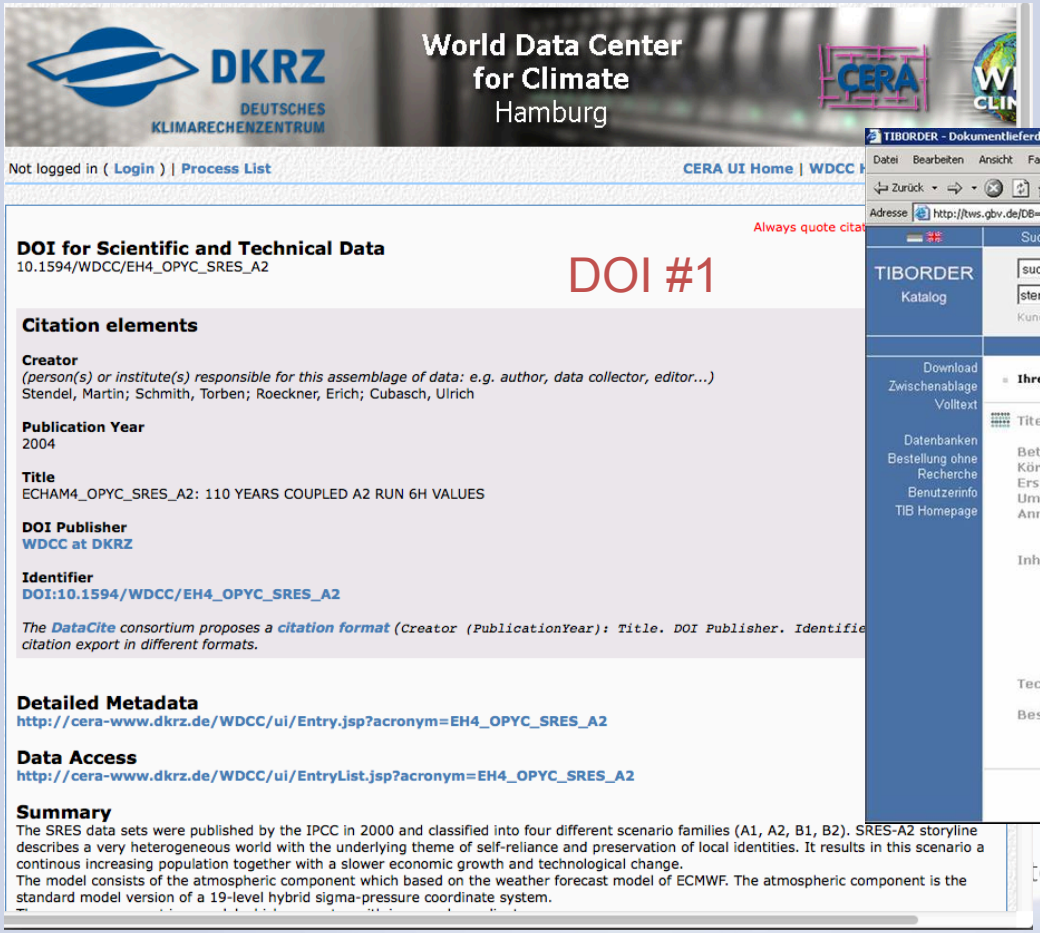
First DOIs from project partners:

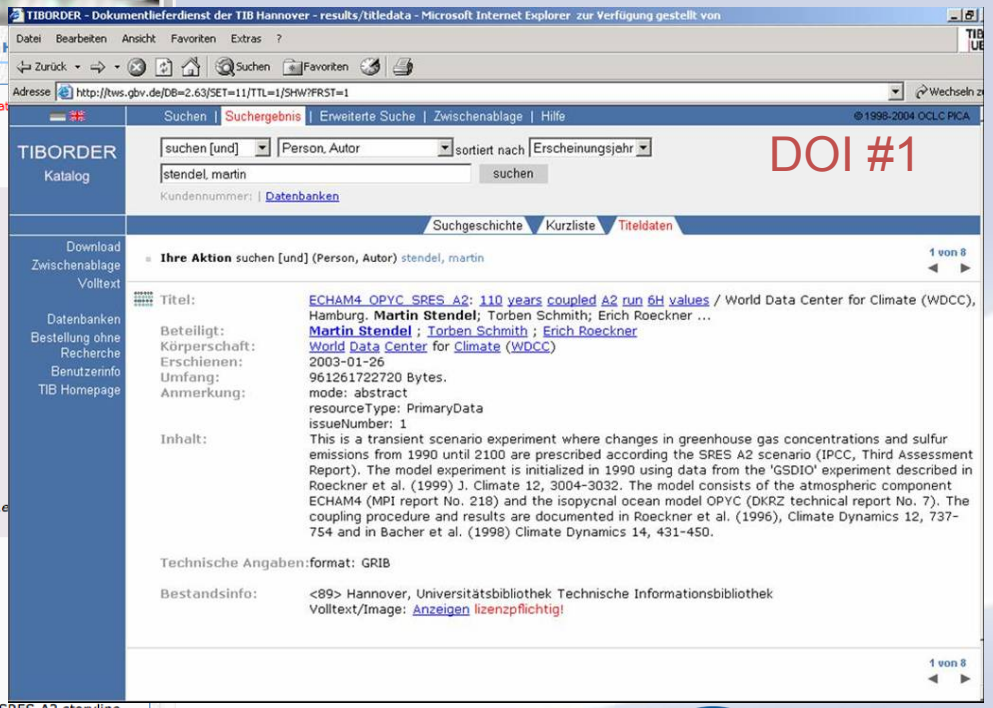
18.03.2004: doi:10.1594/WDCC/EH4_OPYC_SRES_A2 (DOI #1)

22.07.2004: doi:10.1594/GFZ/ICDP/KTB/KTB-GEOCH-GASCHR-P

14.12.2004: doi:10.1594/PANGAEA.119754

End of 2004: about 30 DOIs registered and in library catalogue TIBORDER



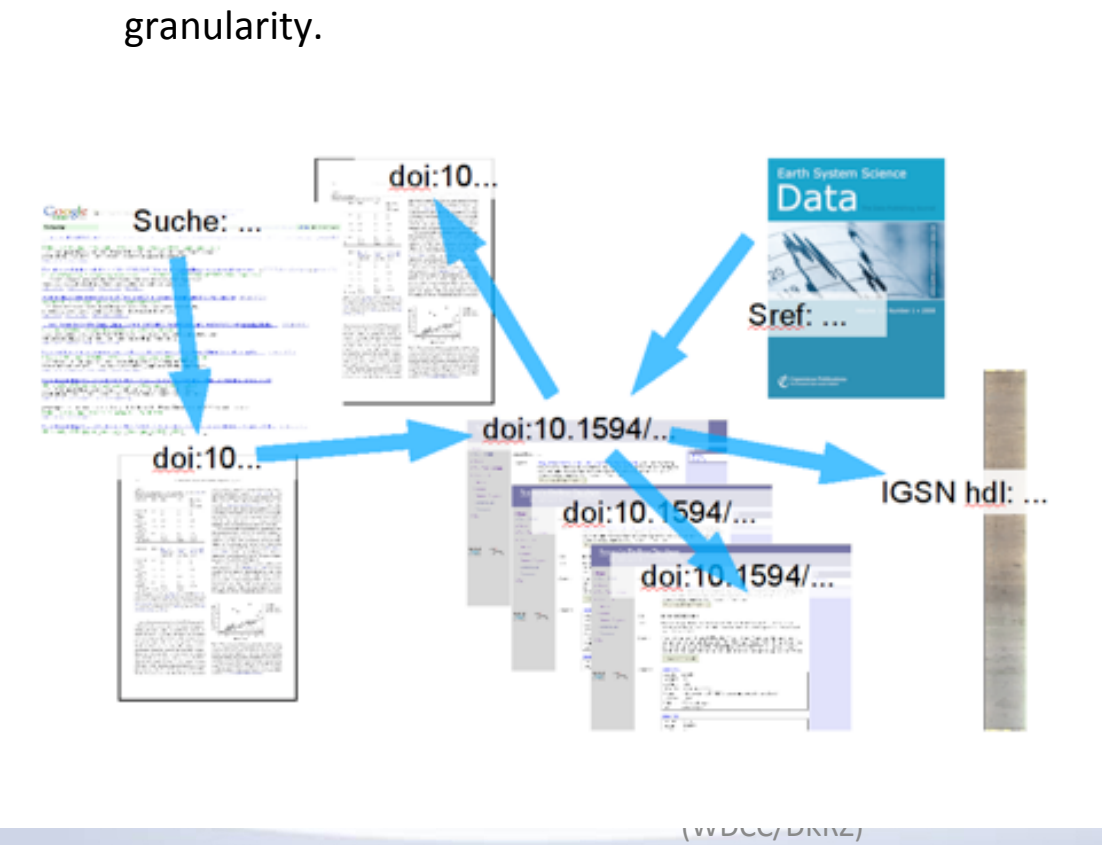


DKRZ

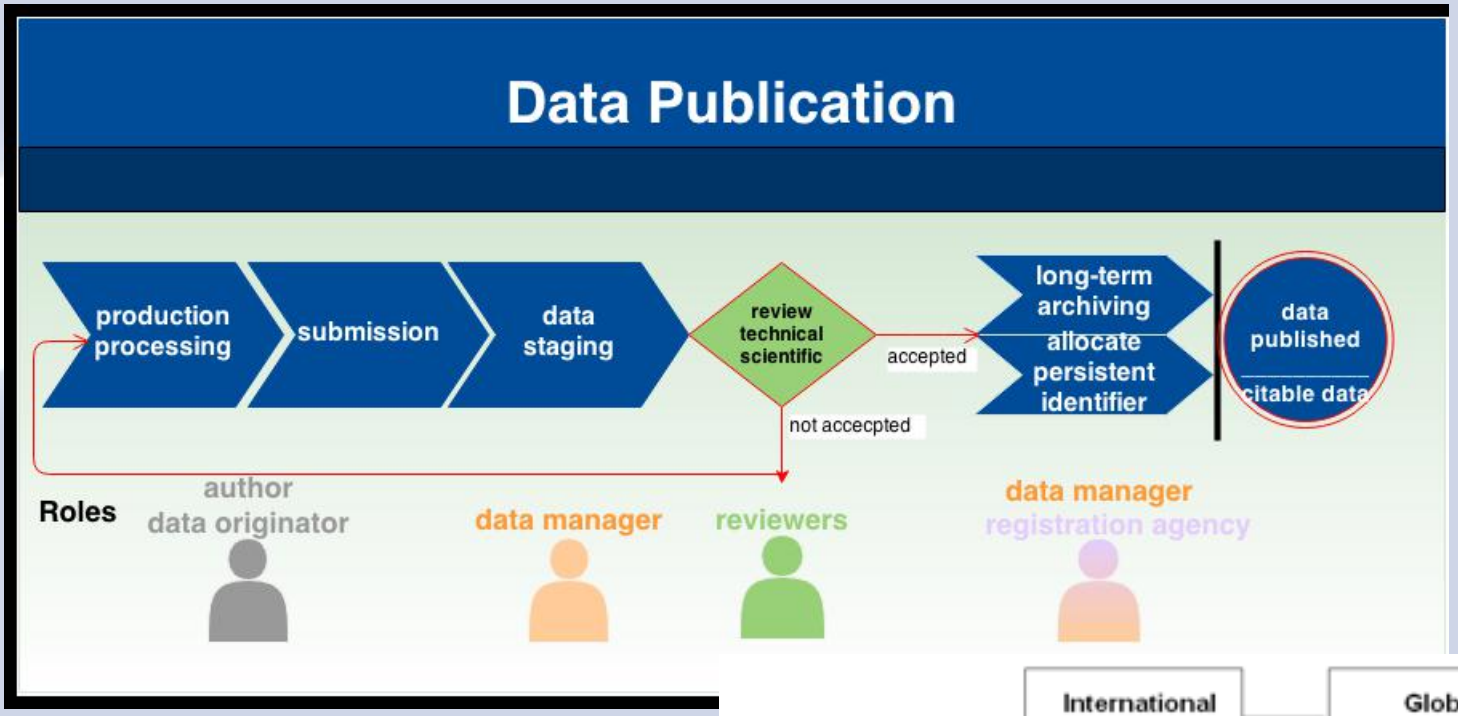
DataCite Evolution (iv)

- 2006 – 2009: STD-DOI Data Publication as a Service
  - Project: 2 1/2 years funded by DFG
    - Partners: TIB (coordination) and 4 data archives WDCC/DKRZ, WDC Mare, GFZ Postdam, and WDC RSAT
  - Focus of Funding period:
    - STD-DOI data publication as operational service
    - Expansion from geosciences to more disciplines
    - Integration of international partners
    - Sustainability and business model
  - TIB Advisory Board 2005:
    - integration of operation of a non-commercial registration agency for scientific-technical primary data into TIB operational services
  - 17 new partners partners from different disciplines:
    - International Ocean Drilling Project, Freiburg Materials Research Center, FLOSS project, Verlag Thieme Chemistry, Office of Scientific & Technical Information, Lamont-Doherty Earth Observatory, and libraries
  - Increasing international interest led to a discussion about the organisational structure and finally led to the foundation of DataCite

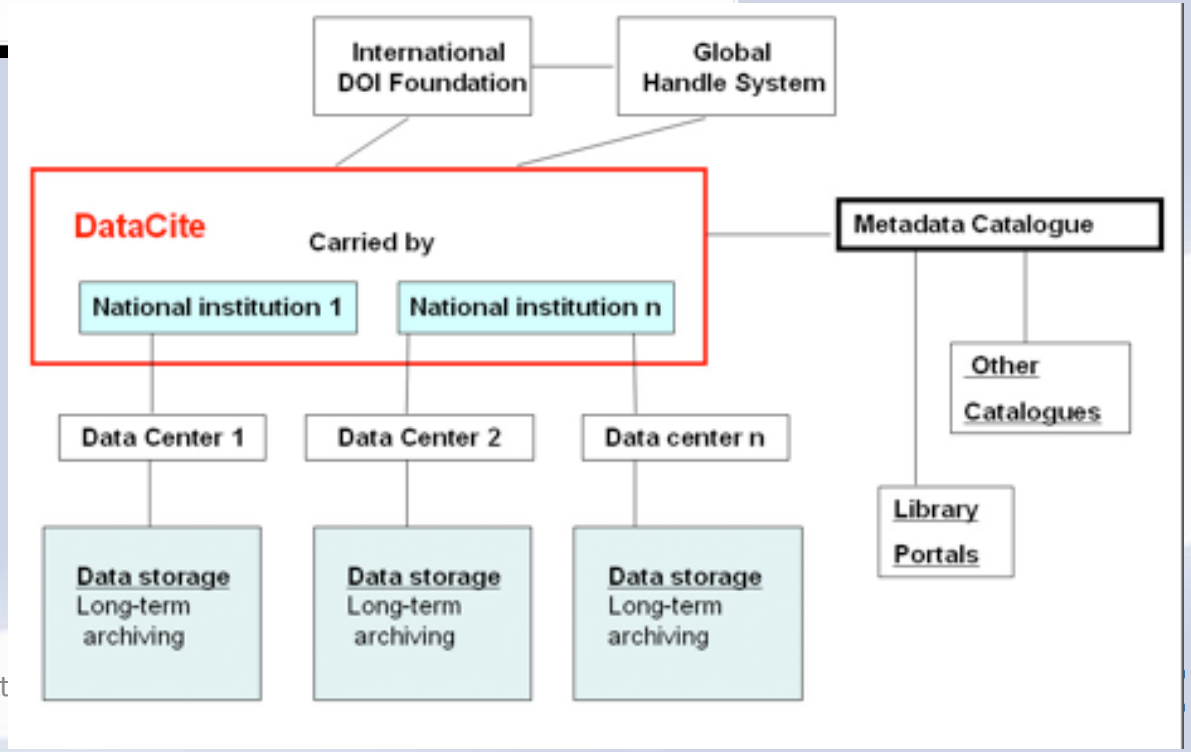
- Points of discussion:
  - Use of scientific data in literature:
    - Supplement: the data are part of an article, e.g. geophysical measurements
    - Independent data publication: an article references to the data, e.g. climate model data, satellite data
  - Granularity:
    - Definition of data entities for STD-DOI data publication which are suitable to appear in reference lists is discipline dependent and normally different from data access granularity.



STD-DOI network of articles, data and samples



Organisational Structure of publications agency, publication agent and finally DataCite



DataCite Evolution (v)

- 2009 – 2014: DataCite
  - December 2009: Formation of DataCite as non-profit organisation in London with 7 members from 6 countries, starting with about 600,000 scientific data STD-DOIs from the TIB Handle Server
  - TIB operated as Managing Agent with office in Hannover and with Jan Brase in person
  - 2010: 15 members from 10 countries and 1 Mio DIOs
  - 2012: Shut down of STD-DOI Handle Server at TIB and final transition to DataCite Handle Server(s)
  - 2014: 22 full members and 9 associated members from 19 countries and 3 Mio DIOs
  - DataCite Metadata Schema
    - list of core metadata properties chosen for the accurate and consistent identification of data for citation and retrieval purposes, along with recommended use instructions
  - Integration into repositories of research data
    - DataBib initiative and their list of repositories
    - Google Docs
    - re3data.org

Global Distribution of DataCite Members

DataCite in Climate Research

Examples are

- DKRZ Data Services and Atarrabi as publication tool

- CMIP5 and DataCite data publication for reference data

DKRZ Data Life Cycle Services

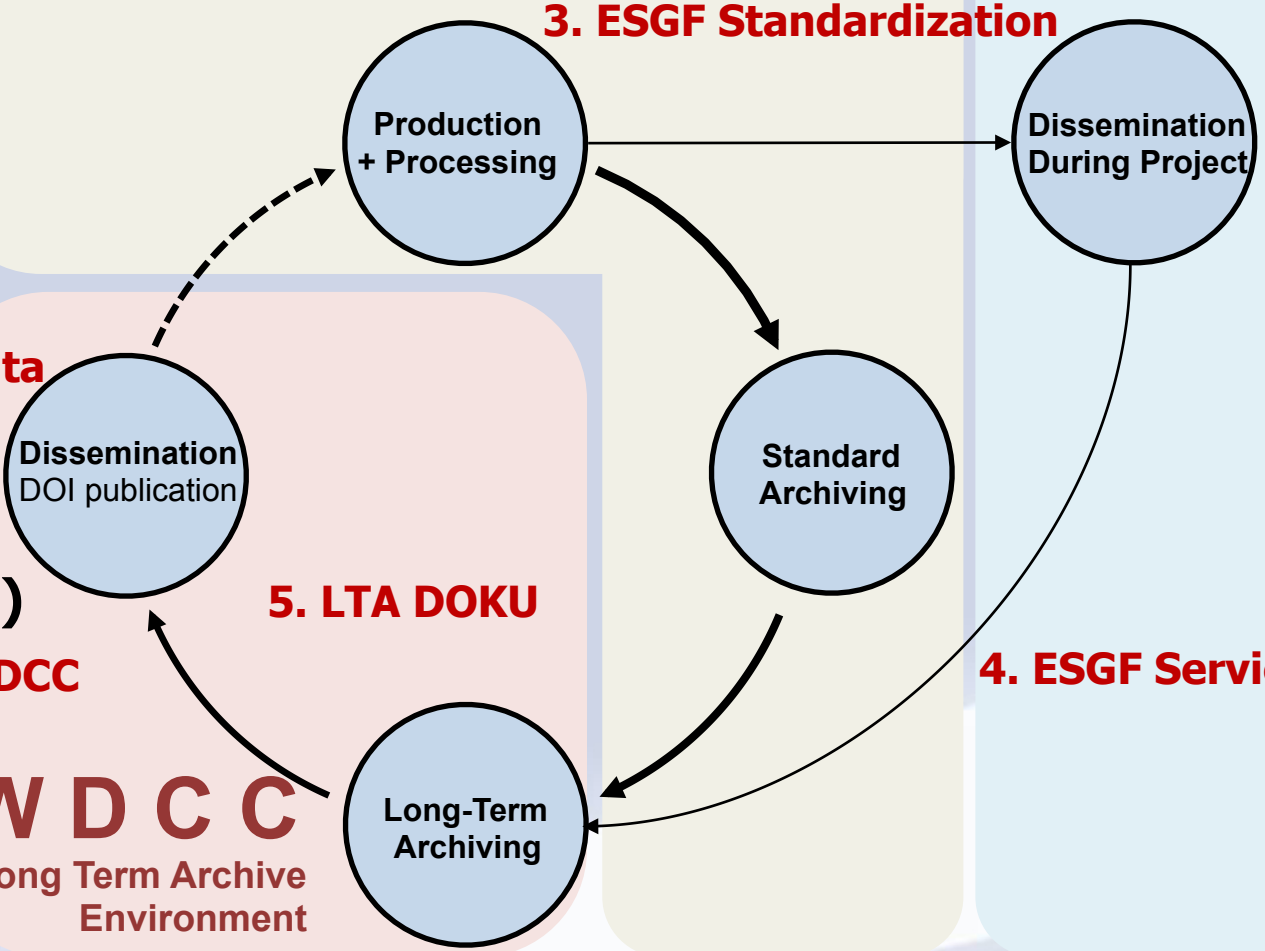
DKRZ Projects

1. Data Management Plan

2. DKRZ Storage

3. ESGF Standardization

E S G F
Standardized Research Data Environment



7. DataCite Data Publication

3.7 PB (07.14)

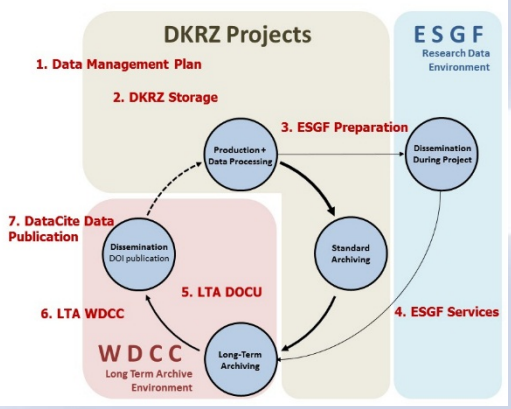
5. LTA DOKU

6. LTA WDCC

4. ESGF Services

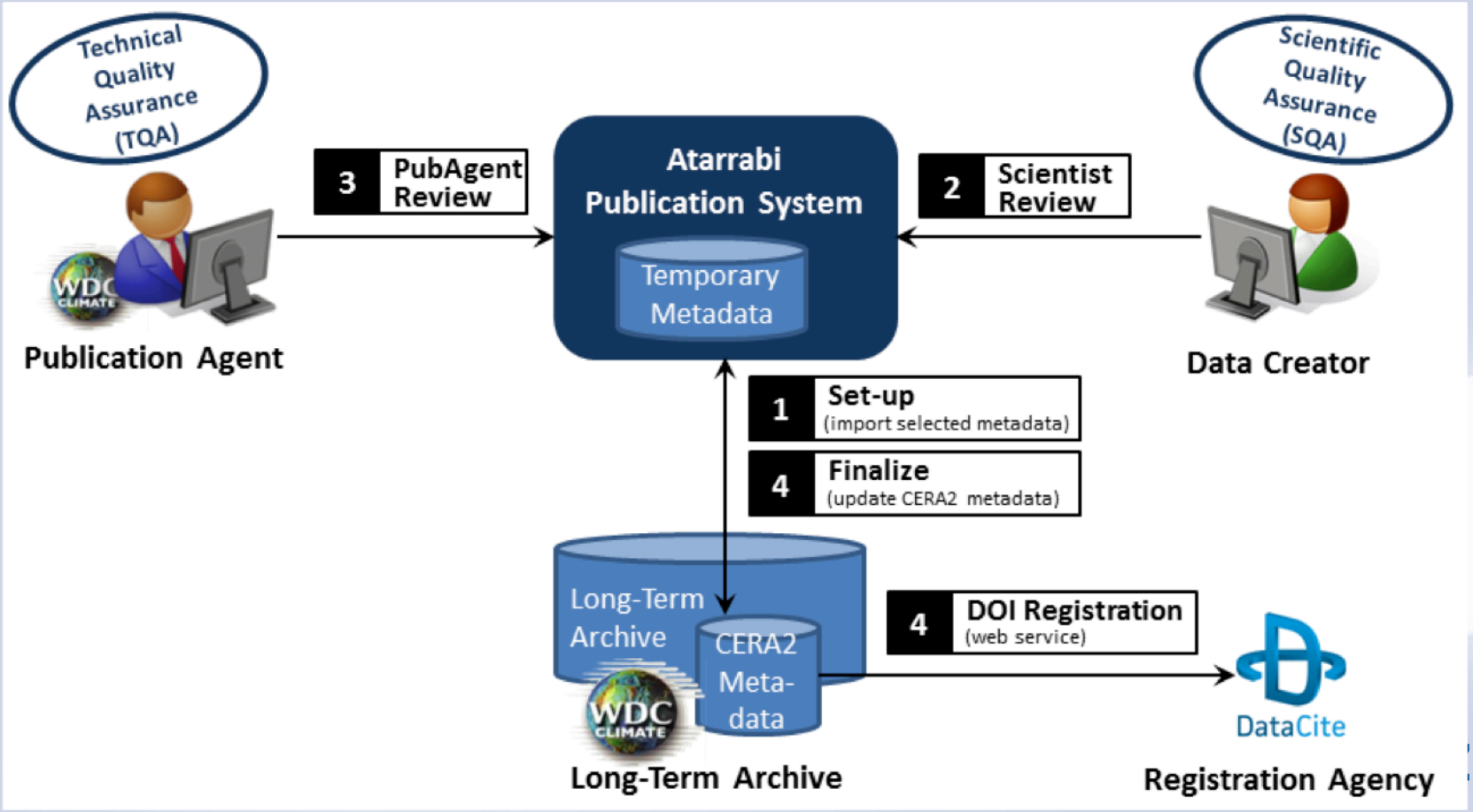
W D C C
Long Term Archive Environment

DKRZ

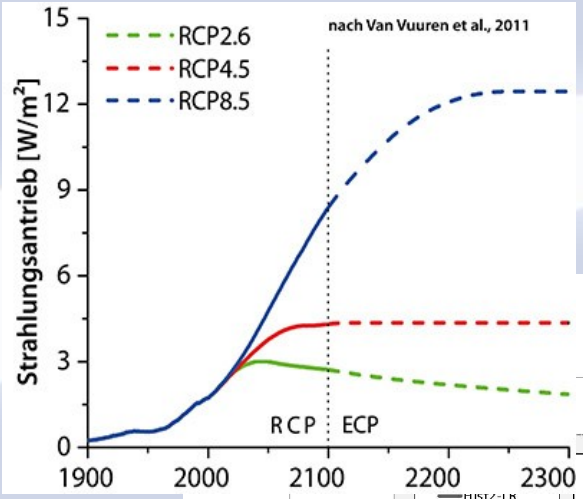


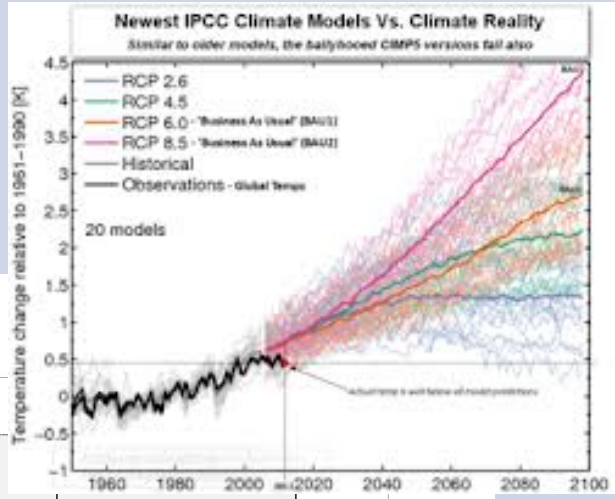
7. DataCite Data Publication at WDCC/DKRZ

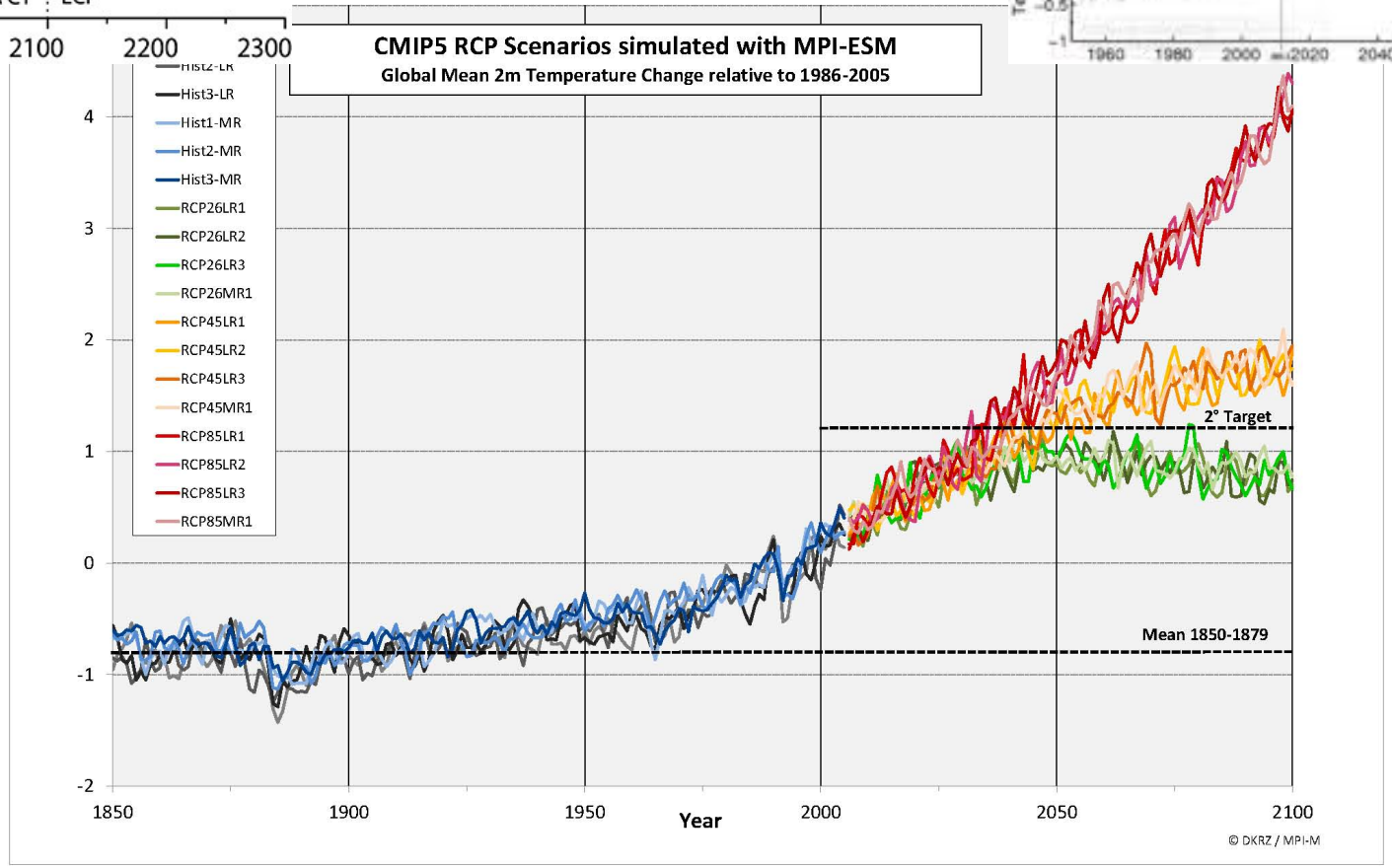
Formal citation of data using DataCite data DOIs allows to give and to get credit for the preparation of high-quality research data and allows for transparent data access via DOI and Handle Server.



CMIP5 Results







Data Amounts CMIP3/CMIP5

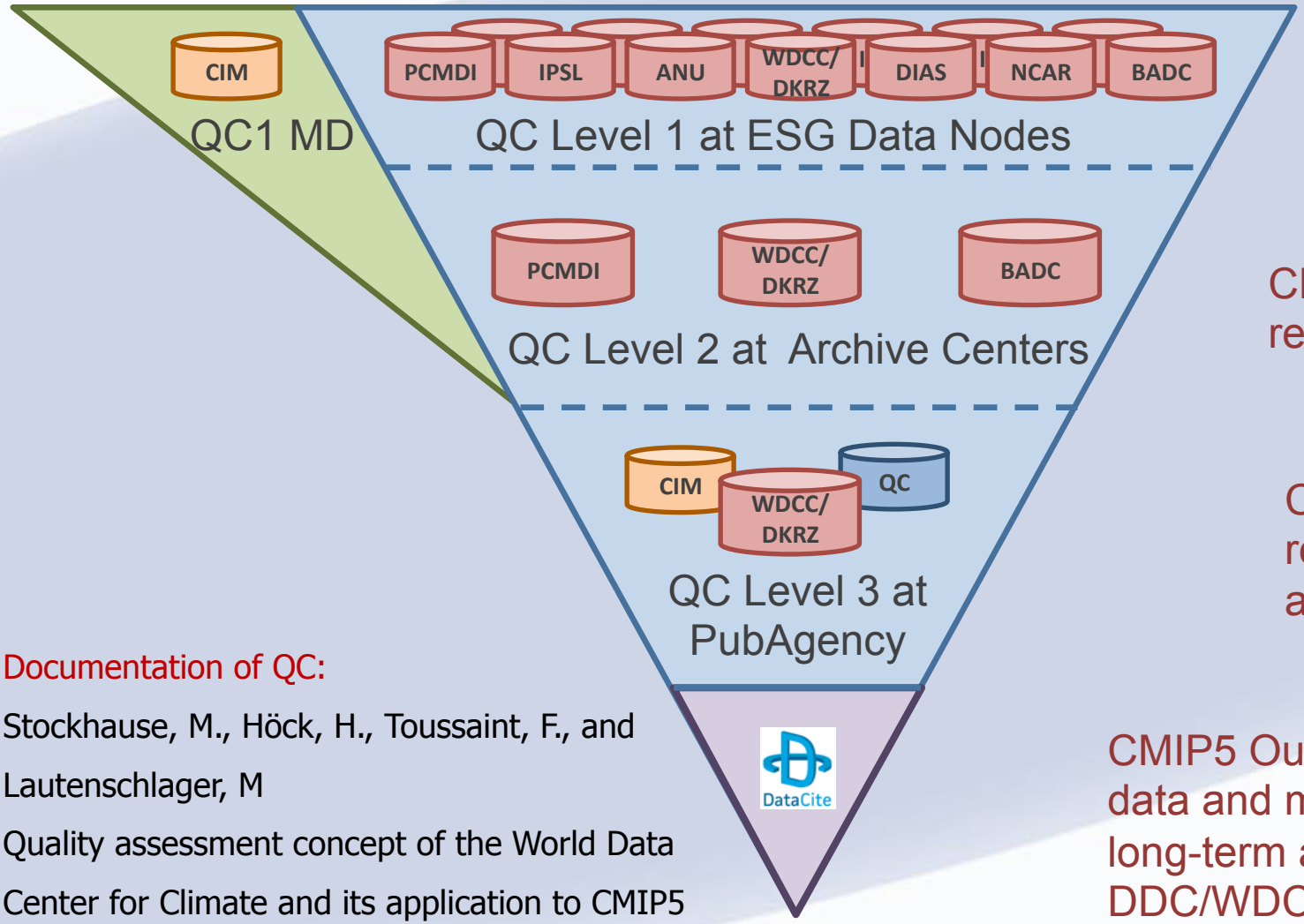
DataCite data publication unit: Model Experiment

- CMIP3 / IPCC-AR4 (Report 2007)
  - Participation: 17 modelling centres with 25 models
  - In total 36 TB model data central at PCMDI and ca. ½ TB in IPCC DDC at WDCC/ DKRZ as reference data

- CMIP5 / IPCC-AR5 (Report 2013/2014)
  - Participation: 29 modelling groups with 61 models
  - Produced data volume: ca. 10 PB with 640 TB from MPI-ESM
  - CMIP5 requested data volume: ca. 2 PB (in CMIP5 data federation)
  - Data volume for IPCC DDC: 1.6 PB (complete quality assurance process) with 60 TB from MPI-ESM

- Status CMIP5 data archive (August 2014):
  - 2.3 PB for 69000 data sets stored in 4.3 Mio Files in 23 data nodes
  - CMIP5 data is more than 50 times CMIP3

3-Layer Quality Assurance Concept



All CMIP5 requested data (CMOR-2)

CMIP5 Output1 / replicated Data

CMIP5 Output1 / replicated data and metadata

CMIP5 Output1 / replicated data and metadata in the long-term archive (IPCC DDC/WDCC)

Documentation of QC:

Stockhause, M., Höck, H., Toussaint, F., and Lautenschlager, M

Quality assessment concept of the World Data Center for Climate and its application to CMIP5 data. Geosci. Model Dev., 5, 1023-1032 , 2012

DOI : 10.5194/gmd-5-1023-2012

Finalisation of Quality Assessment

- After final control of data and metadata CMIP5 data are transferred from the ESGF archive (*most recent version*) into the reference data archive (*snapshot around March 2013*)
  - Quality status: „approved by author“
  - Data are marked as irrevocable
  - Long-term archiving in WDC Climate of DKRZ
- Final step is the DataCite data publication and integration of associated citation reference into library catalogues
  - Data entity (here one climate model experiment) receives a citation reference for direct usage in scientific publications and a DOI (Digital Object Identifier) for the transparent data access
  - Citation reference contains data author and title as well as WDC Climate as DataCite DOI publisher and the DOI
  - Resolution of the DOI leads to a „Landing Page“, which address is stored in the central data base of the DOI Handle Server at DataCite

Status QC for CMIP5

- QC Status CMIP5 (August 2014)
  - Quality Control 1: 1142 Experiments
  - Quality Control 2: 910 Experiments (finalised 680)
  - Quality Control 3: 994 Experiments
  - DataCite DOI: 240 Experiments (WDCC / IPCC-DDC)
    - RCPs, AMIP, Historical

IPCC Data Distribution Centre:

http://www.ipcc-data.org/sim/gcm_monthly/AR5/index.html

DataCite DOI Interface at WDCC (CMIP5 Reference Data Archive)

- Show me all data entities in the WDCC, which have an DataCite DOI
  - URL: http://cera-www.dkrz.de/WDCC/ui/FindDoiPublications.jsp

- Show me for a given CMIP5 NetCDF/CF dataset, whether it belongs to a DataCite published data entity
  - URL: http://cera-www.dkrz.de/WDCC/CMIP5/Citation.jsp

My DataCite Wish List

Beside fostering citation of scientific data I would like to see more emphasis from DataCite on

- Keeping the focus on irrevocable and well-documented scientific data products
- Use DOIs for data entities with a granularity that is suitable for reference lists in scientific work
- Integrating trusted, certified data centres into DataCite in order to ensure quality and accessibilty of data and services

DataCite should strengthen its branding.