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FROM ATMOSPHERIC CHEMISTRY TO EARTH SYSTEM SCIENCE

CONTRIBUTIONS TO THE RECENT HISTORY OF THE MAX PLANCK INSTITUTE FOR CHEMISTRY (OTTO HAHN INSTITUTE), 1959 – 2000

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PREFACE

The phrase "*Earth System*" first became important in research and research-policy contexts in 1983 because of its use by the NASA *Earth System Committee*. This represented a major step towards initiating "global change" research, which has had a long-term influence on national and international research programs and organizations. The "Earth System" concept, nowadays a well-known buzzword, gained extensive popularity in the context of the large *global change* programs, for example the *World Climate Research Program* (WCRP) and the *International Geosphere Biosphere Program* (IGBP).[1] The *Earth System Sciences* (ESS) are comparatively new and examine the interactions and mutual influences in and between the Earth's subsystems (biosphere, geosphere, cryosphere, hydrosphere, atmosphere etc.). The formation and consolidation of ESS as an independent discipline can be regarded as having been largely completed by the mid-2000s in Germany. This is based on the assumption that the following parameters can be used for the formation and consolidation of an independent academic discipline: 1. Large-scale funding in connection with research programs and the foundation of new institutions. 2. The establishment of professorships and courses of study, along with the associated education of young academic talent. 3. The formation of specific journals and a canonization process for the specialist literature.[2]

1 Cf. Uhrqvist/Lövbrand, Rendering global change.

2 Schützenmeister described this, taking atmospheric research as an example. Cf. Schützenmeister, Zwischen Problemorientierung, 109 f.

In Germany today, all major institutions and organizations of the German science system are involved, e. g. the Leopoldina,[3] the Max Planck Society (MPG),[4] the Helmholtz Association (HGF),[5] Leibniz Institutes, such as the Institute for Tropospheric Research in Leipzig (TROPOS),[6] the German Research Foundation (DFG)[7] and several universities, such as Mainz, Hamburg, Bremen, and Hohenheim.

The origins of the ESS however, do not lie in the Earth System concept which began in the early 1980s, but rather in the atmospheric sciences rapidly emerging in the mid 1950s in particular in the US and Sweden, whose approaches developed from the primary observation of atmospheric phenomena to the examination of interactive relationships and exchange processes between the atmosphere and other spheres of the Earth (biosphere, geosphere, cryosphere etc.). This integrative perspective resulted in particular in the long-term formation of climate research at both an organizational and epistemic level, and which since the second half of the 1950s has been mainly influenced by opinions that were mechanistic and decidedly based on atmospheric *chemistry*. These opinions gradually began to gain hold in the FRG only in the late 1960s, with a considerable latency compared with the US, for example, and significantly enhanced classic German meteorology, which previously was primarily geared towards weather phenomena and weather forecasts and lagged behind international developments by a good decade.

3 See the Internet presence of the Leopoldina's Earth System Research Working Group: <https://www.leopoldina.org/politikberatung/arbeitsgruppen/erdsystemforschung/>. Status: May 23, 2018.

4 Andreae/Marotzke/Heimann, Partnerschaft Erdsystemforschung.

5 Cf. Helmholtz-Gemeinschaft, Helmholtz-Roadmap.

6 See TROPOS' description of the research of dust sources as given on their Internet presence: <http://www.tropos.de/institut/abteilungen/modellierung-atmosphaerischer-prozesse/transportprozesse/staubquellen/>. Status: May 23, 2018.

7 See the description given by the Senate Commission on the DFG website: <http://www.dfg.de/dfg_profil/gremien/senat/erdsystemforschung/>. Status: March 9, 2018.

Both the establishment of new integrative approaches in German atmospheric research and the history of atmospheric and Earth System sciences as a whole are inextricably linked to the Max Planck Society. Starting in 1968, and for roughly the next four decades, an Earth System cluster with a steadily growing personnel and institutional network was formed in the MPG. At the epistemic level, it forced the use of specific approaches and methods. At the science-policy level, it gained significant influence both within the MPG and in the FRG and the international scientific community.

Central pillars of this process were the establishment of a department for atmospheric chemistry at the MPI for Chemistry in Mainz (MPIC) in 1968, under the leadership of meteorologist Christian Junge, and the founding of the MPI for Meteorology (MPI-M) in Hamburg 1975, and finally the MPI for Biogeochemistry (MPI-BGC) in Jena in 1996/1997. Alongside these three major institutes, there were other facilities that took, or still take, Earth System approaches at a department level. An example of this is the department for cosmophysics at the MPI for Nuclear Physics in Heidelberg. Between 1994 and 2003 there were two directors there. One of them was Konrad Mauersberger, who led the group for atmospheric physics that took approaches that were clearly Earth-system-based. During his term, Mauersberger was a member of almost all commissions that dealt with appointments and topic areas at or relating to the MPIs for Chemistry, Meteorology and Biogeochemistry. One particular visible manifestation of the Earth System cluster at the MPG came in the form of the "Earth System Research" partnership that was established in 2006.[8] This initiative currently represents the MPG's Earth System research cluster both internally and externally, and functions as a coordinating forum, information portal, and shared presence.

The subject matter covered by the present observations is the settlement, establishment and expansion of atmospheric and Earth System

8 Andreae/Marotzke/Heimann, Partnerschaft Erdsystemforschung.

science research at the Max Planck Institute for Chemistry in Mainz. Within the MPG, the institute is both the origin and one of the pillars for these areas. The overall history of the formation of the Earth System cluster at the MPG, which has spanned roughly four decades, is part of the program for the history of the Max Planck Society (GMPG), which was initiated in 2014 and is based at the Max Planck Institute for the History of Science. In this program, additional work will be carried out in connection with an "Earth System Sciences" subproject which commenced in January of this year. The present observations are to be considered in this regard also as foundations in the context of this subproject, contributing to the overall historical understanding of the development of ESS at the MPG, in the scientific landscape in the Federal Republic of Germany and in the national and international scientific community.