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• *Fog types – Fog chemistry – Fog collection – Cloud forests – Wind-driven rain*

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Fog Research

Nebelforschung

With 4 Figures and 1 Table

This paper serves as an introductory paper to the special issue on fog research. First, a general introduction to the climatic element of fog is given, followed by an overview of current fog research as presented at the 4th International Conference on Fog, Fog Collection and Dew in La Serena, Chile in summer 2007. A selection of papers that cover geographical aspects of fog research or provide an insight into fog collection are included in this special issue of DIE ERDE (volume 139, issue 1-2).

1. Introduction

Fog is not a consistent and continuous climatic phenomenon (*Wanner* and *Kunz* 1983) and thus research interests related to fog are often closely linked with geographical places where fog occurs frequently and thus is considered a relevant component of the respective climate. For example, San Francisco (USA) is considered "fog city" (*Gilliam* 1962), a result of the proximity of the city to the cold Pacific Ocean and the west wind drift that advects dense fog banks from the sea onshore.

Another locality where fog seems to be intimately linked with the city's name is London. *Blake* (1871) names it the "genuine London fog", but basically describes the special phenomenon that is nowadays generally termed "smog", the combination of acidic smoke and dense fog which was "so irritating to the eyes, that although there was nothing in the opera to move one, the audience seemed to be perpetually in tears" (*Blake* 1871: 76). Even more than one hundred years later, the chemistry of fog is one of the most active fields of scientific research on fog (e.g. *Collett* et al. 2002, *Fuzzi* et al. 2008, *Collett* et al. 2008).

1.1 Definition of fog

Depending on disciplines a wealth of terms for fog have evolved, but no consistent use of these terms

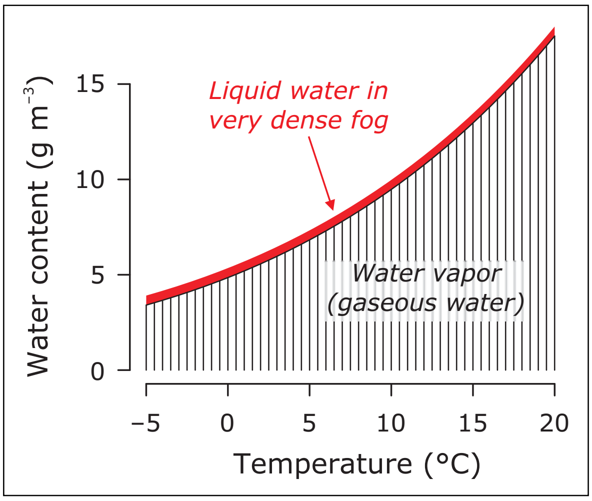

Fig. 1 Even with very dense fog most of the atmospheric water is in the gaseous phase (water vapor) whereas the liquid water from fog droplets only adds a very small amount (typically less than 0.5 g m^{-3}, in red). / *Auch bei sehr dichtem Nebel liegt der größte Teil des atmosphärischen Wassers gasförmig (als Wasserdampf) vor, während das flüssige Wasser aller Nebeltröpfchen einen sehr kleinen Anteil beisteuert (typischerweise weniger als 0,5 g m^{-3}, in rot eingezeichnet).*

can be found, not even within a given discipline. Meteorologists for example most commonly use the definition that fog occurs if the horizontal visibility is less than 1000 m (*Glickman* 2000). Since visibility can also be well below 1000 m during heavy precipitation and other specific phenomena, *Glickman* (2000) extended the commonly used meteorological definition with the requirement that fog consists of cloud droplets in the air that reduce the visibility and are less than 200 µm in size. Thus, in principle, fog is a cloud that touches the ground surface and envelops the observer. Knowing this resolves many inconsistencies in terminology that relate to common use of language. For example, in German a forest strongly influenced by frequent and persistent fog is termed "*Nebelwald*" (fog forest), whereas the correct English terminology is "cloud forest", even when this cloud touches the ground surface and is thus termed a "fog".

The effect of liquid cloud droplets on visibility is so strong that one easily forgets that even in a very dense fog the lion's share of atmospheric water is still in gaseous form, and not in liquid phase (*Fig. 1*).

1.2 Types of fog

An attempt to group available terminology and thus provide a set of terms that are used rather frequently and in a more or less consistent manner (*Fig. 2*) was made by this author in the Encyclopedia of Hydrological Sciences (*Bruijnzeel* et al. 2005, *Anderson* 2005). Apart from ice fog and urban fog, which are only used in very localized contexts, there are seven types of fog that can be distinguished. Four of them are named according to where the fog was formed and the process that formed the fog (radiation fog, sea fog, steam fog, advection fog), and three types are rather geographical terms of where fog occurs, irrespective of where and how it was formed (coastal fog, valley fog, mountain fog).

Radiation fog is the type of fog that is very common in areas where cold air can accumulate during the night, or for longer periods in winter. Especially in remote sensing studies using satellite images (e.g. *Bendix* 2002, *Cermak* and *Bendix* 2008) it is this type of fog which is usually observed. Since satellite images only show the top of the fog banks it is generally not possible to de-

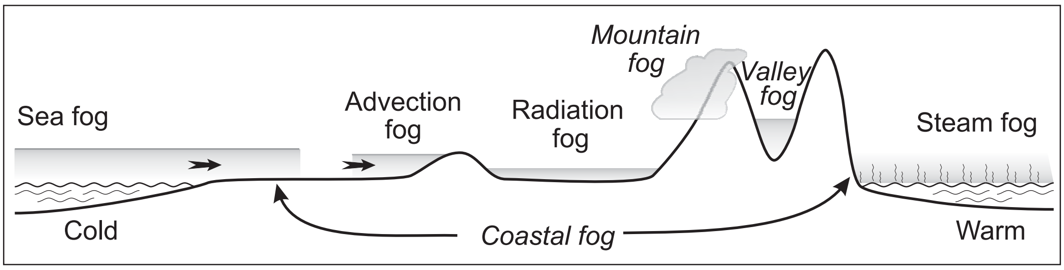

Fig. 2 Types of fog according to *Bruijnzeel* et al. (2005). Terms in upright font are process-based types, those in italics are geographic types. Additionally, the terms "ice fog" and "urban fog" are used for very local types of fogs. Reprinted from *Bruijnzeel* et al. (2005) in *Anderson* (2005): 562; reproduced with kind permission of John Wiley & Sons Ltd. / *Nebeltypen nach Bruijnzeel et al. (2005). Begriffe in Normalschrift bezeichnen Nebeltypen, die nach deren Entstehungsprozess benannt sind, solche in Kursivschrift hingegen Typen, die nach deren geographischem Vorkommen bezeichnet werden. Zusätzlich existieren die Begriffe "Eisnebel" und "Stadtnebel" für sehr lokale Nebeltypen. Quelle: Bruijnzeel et al. (2005) in Anderson (2005): 562; wiederabgedruckt mit freundlicher Genehmigung von John Wiley & Sons Ltd.*

termine with sufficient confidence whether the cloud touches the ground surface or not. Therefore, the more generally valid term "stratus cloud" is used in order not to be too speculative on the processes that produced the fog. Raised fog (*Hochnebel* in German) and surface fog (*Bodennebel* in German) can be included in such a way without being in conflict with the generally accepted definition of fog according to *Glickman* (2000).

Sea fog and steam fog are both produced over the open oceans, but with the distinct difference that sea fog is fog that forms due to cooling of humid air over a cold ocean surface, whereas steam fog is typically formed when cold air with low water vapor saturation capacity flows over a warm water surface that evaporates water at a higher rate than the cold air can hold. The excess water vapor condenses to tiny droplets that form the steam fog.

Advection fog requires a steady wind that moves a fog layer that has formed upwind of a given site. Thus, in contrast to radiation fog that basically implies weak wind conditions or stagnant air masses, the advection fog may have different properties. Droplet sizes typically range between 1 and 30 µm in advection fogs but can reach sizes well above 50 µm in well-developed radiation fogs (*Bruijnzeel* et al. 2005).

Coastal fog is typically an advection fog, as observed in the San Francisco area (*Gilliam* 1962), the Atacama coastal desert (e.g. *Cereceda* et al. 2008, *Cereceda* et al. 2008), the Namib coastal desert (e.g. *Seely* and *Hamilton* 1976, *Lange* et al. 1994), or in polar regions during the summer when the land surface is warmer than the cold ocean surface. In such cases, the steady onshore winds transport the dense sea fog that forms offshore over the coast.

Valley fog is typically a radiation fog that forms in a mountain valley, whereas mountain fog is a cloud (not necessarily a stratus or stratiform cloud) that moves over the land surface at a certain height which is known as the lifting condensation level in convective clouds and then touches the ground surface on mountains as orographical obstacles. Especially tropical montane cloud forests are thought to be highly influenced by this variety of fog.

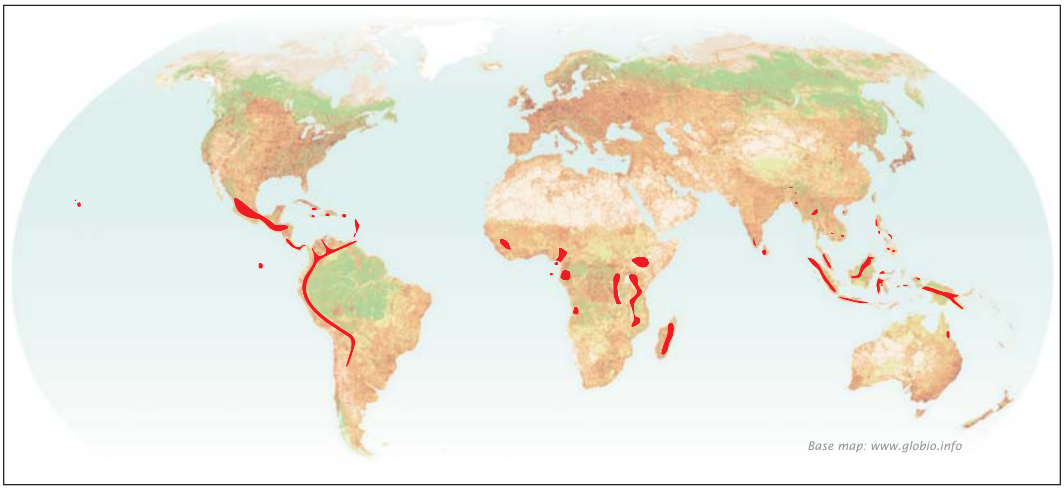

Fig. 3 Areas with fractions of tropical cloud forests (in red), including tropical montane cloud forests. Compiled and generalized after *Bubb* et al. (2004). Base map uses the Robinson projection and shows the world's status in 2002 (http://www.globio.info/region/world/world_robinson.png, 12.11.2007). / *Gebiete mit Anteilen von tropischen Nebelwäldern (in rot), inklusive tropischer montaner Nebelwälder. Zusammengestellt und generalisiert nach Bubb et al. (2004). Die Basiskarte in der Robinson-Projektion zeigt den Zustand der Welt im Jahre 2002 (http://www.globio.info/region/world/world_robinson.png, 12.11.2007).*

1.3 Relevance of fog

Fog research does not belong to the mainstream research areas, but occasionally enjoys room in highly ranked scientific journals. An example is the hypothesis by *Pounds* et al. (1999) that a reduction in fog frequency in Central American mountain ranges might lead to dramatic increases in adult mortality of highland amphibians (tree frogs and toads). Further evidence and argumentation was later presented by *Pounds* (2001) and *Pounds* et al. (2006). Whereas amphibians may just be one group of indicator species that quickly respond to changes in fog occurrence, cloud forests are generally found to be hotspots of biodiversity that require specific conservation efforts. Therefore, UNEP has established a Cloud Forest Agenda (*Bubb* et al. 2004) that specifically addresses the need for action in tropical cloud forest habitats (*Fig. 3*).

Fog water inputs to the ecosystem is considered a relevant component in the hydrological budget in Californian coastal forests (*Byers* 1953, *Azevedo* and *Morgan* 1974). The naturally occurring stable isotopes in water were successfully used as tracers to confirm that Redwood trees along the Californian coast can take up fog water at the leaf level and thus prevent dehydration during the dry season (*Ingraham* and *Matthews* 1990, *Ingraham* and *Matthews* 1995, *Dawson* 1998, *Burgess* and *Dawson* 2004).

In some cases it has even been documented that fog water deposition is not only relevant for single plants, but is also contributing to the hydrological budget of an area, and can contribute to the recharge of the ground water (*Ingraham* and *Matthews* 1988, *Guswa* et al. 2007).

Eugster et al. (2006) on the other hand found that although the contribution of fog water to the hydrological budget of an elfin cloud forest in Puerto Rico is considerable and higher than in any other location, it is still not a very large component in the budget. Thus, the relevance of fog at a given geographic locality may very much depend on the concurrent amounts of precipitation and the seasonality of the two water sources. There is no doubt that in desert areas where rain is absent during many months or perhaps several years fog must be seriously considered as a source of water in the hydrological context.

At many other locations, however, the relevance of fog is rather expected to be related to the dissolved inorganic and organic compounds in fog water that can act as either nutrients (nitrogen, sulphate, phosphate) or pollutants. *Figure 4* illustrates the pathways how these nutrients and pollutants influence an ecosystem. Many studies show that concentrations of inorganic compounds are often much higher in fog than in rain. Thus, even minor hydrological inputs of fog water can lead to major inputs of nutrients and pollutants (e.g. *Weathers* et al. 1988, *Weathers* et al. 2000, *Thalmann* et al. 2002, *Burkard* et al. 2003).

2. Special Issue on Fog Research

Since 1998 fog and dew research scientists from all parts of the world have met every third year to exchange newest results and experiences. In 2007 *Pilar Cereceda* and her crew from the Geographical Institute of the Pontificia Universidad

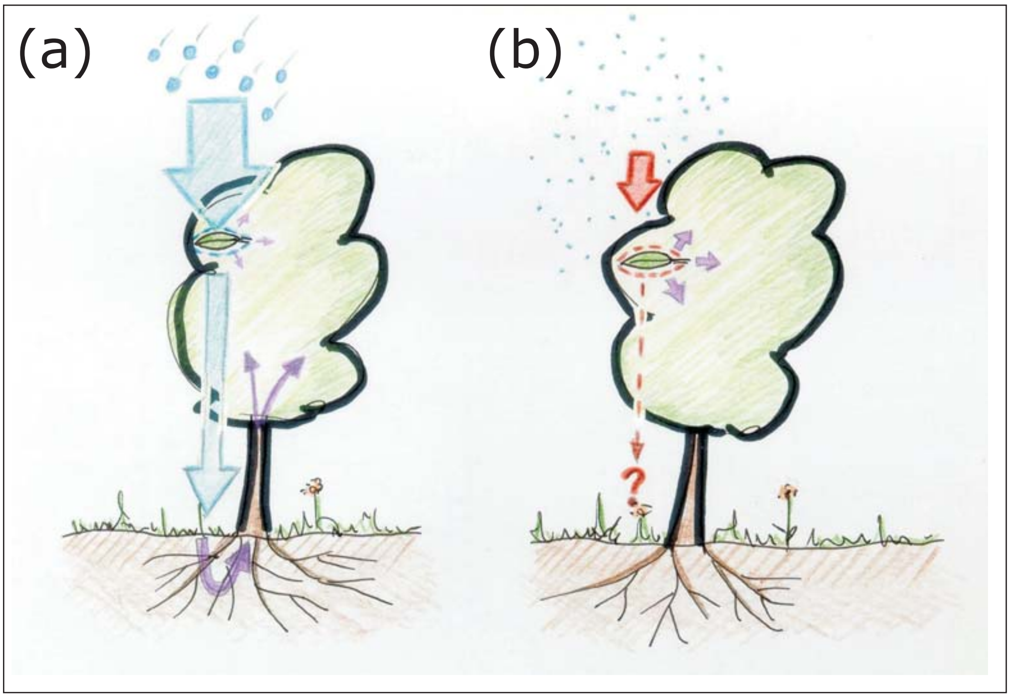

Fig. 4 Schematic showing the similarities and differences between nutrient and pollutant inputs to ecosystems by a) rainfall and b) fog deposition / *Schema zu Ähnlichkeiten und Unterschieden der Wirkungsweise von Nähr- und Schadstoffen in Ökosystemen durch a) Regeneintrag und b) Nebeleintrag*

Católica de Chile at Santiago organized the fourth International Conference on Fog, Fog Collection and Dew in La Serena, Chile, from 22 to 27 July 2007. In total, 117 scientists attended the conference and contributed 31 posters and 82 oral presentations which were presented in short four-page conference proceedings papers (see *Biggs* and *Cereceda* 2007). The classification of these presentations in fields of interest (*Tab. 1*) provides a good overview of current topics and interests in global fog research.

From the wealth of contributions we selected a set of contributions for this special issue which either have a certain geographical focus or provide an insight into fog collection, an applied field of fog research that deals with fog as a potential resource of potable water in arid regions.

The first article by *Möller* (2008) provides the first comprehensive review of scientific developments that helped to advance our understanding of the physics and chemistry of atmospheric waters, of which fog and dew are two important components. Many historical scientific documents that *Möller* includes in his overview are originally only available in German or French, and thus the article makes a wealth of puzzling, surprising and sometimes unexpected insights into fog research available to the English readers who might otherwise not have access to such historical documents.

García-García and *Zarraluqui* (2008) present the first climatological maps of fog distribution and fog frequencies of Mexico. This article also highlights the methodical issues related to the discontinuous phenomenon of fog and provides an excellent example of the small-scale variability of fog, which is typical not only for Mexico but for most localities on earth where topography and radiation fog are strongly interrelated.

Tab. 1 Focus areas of fog research based on the classification used for the Fourth International Conference on Fog, Fog Collection and Dew in La Serena (Chile), 22-27 July 2007 / *Aktuelle Schwerpunktthemen in der Nebelforschung gemäss der Klassifikation, die für die Fourth International Conference on Fog, Fog Collection and Dew in La Serena (Chile), 22.-27. Juli 2007, verwendet wurde*

Session	**Session title**	**Oral presentations**
1	Fog climatology and patterns	8
2	Fog monitoring and modeling	13
3	Fog forecasting	8
4	Fog water chemistry	16
5	Dew instrumentation and collection	8
6	Dew and the environment	8
7	Fog interaction with vegetation	8
8	Fog collection projects	5
9	Fog–Human interaction	4
10	Community involvement in fog collection	4

The Mexico basin example presented by *García-García* and *Zarraluqui* (2008) is symptomatic for many airports worldwide that are located in areas of frequent fog. Flat areas next to historically grown cities are often low-lying wetlands in topographical basins that have only recently been claimed for the development of airports, and the detrimental effects of frequent fog for air traffic were mostly not included in the site evaluation.

Gonçalves et al. (2008) found that fog and drizzle events in São Paulo, Brazil, have significantly decreased over the past 70 years. Their multivariate statistical analysis shows a close correlation of the decreasing frequencies with increasing South Atlantic sea surface temperatures. Although quite speculative in their interpretation the authors provide an interesting example of how urban fog that we generally would only expect to be a function of urbanization could actually also be influenced by larger-scale climate changes that affect the frequency of fog and drizzle in such metropolitan areas.

Whereas in metropolitan areas urban sprawl transforms large areas of the landscape, it is the change in agricultural activities in rural areas that influences local climate and thus fog. *Montecinos* et al. (2008) present a numerical modeling example using a restricted area mesoscale model that allows to estimate the impact of changes in irrigated agricultural lands in arid Chile on local climatic conditions and the formation of valley fog.

Marzol and *Sánchez Mégia* (2008) and *Molina* and *Escobar* (2008) both investigate the collection potential for fog water that can be used either for irrigation of crops or as potable water in dry areas or during the dry season. Many fog collection projects have been started at several places in the tropics and subtropics, and initial scientific investigation of potential localities and their yields is a requirement before large fog water collection screens can be set up.

The last article by *Gerold* et al. (2008) was not presented at the conference but fits thematically into the context of this special issue. It nicely shows the role of fog in shaping tropical montane cloud forests, but it also clearly shows that there is not a sharp and crisp boundary between rain forests and cloud forests, and that even in tropical montane cloud forests the rain is the dominant hydrological input.

3. Conclusions

Fog research has many facets of which only a few can be touched in this special issue. One of the goals of the triennial Conferences on Fog, Fog Collection and Dew has always been to bridge the gap between leading scientists working in the natural sciences and those interested in applied work on fog collection, primarily in developing countries. From the viewpoint of geography as an integrative science which aims at providing the link between natural and social science it would be strongly desirable to see more scientific work on the human dimensions and social aspects that relate to fog collection projects. During the 2007 conference in Chile several contributions (see *Biggs* and *Cereceda* 2007) reported on experiences gained in specific projects which show the potential for more integrative scientific studies that could extend their view well beyond the natural sciences and provide valuable contributions on questions such as: Are fog collection projects more sustainable than other development projects that address the need for potable water at such locations? What are the essential components of community involvement that make a fog collection project successful in the long term? Hopefully, some answers to these and many more open questions will be addressed during the next conference in 2010, which will be hosted by the University of Münster, Germany.

4. References

Anderson, M.G. and *J.J. McDonnell* (eds.) 2005: Encyclopedia of Hydrological Sciences. – Chichester et al.

Azevedo, J. and *D.L. Morgan* 1974: Fog Precipitation in Coastal California Forests. – Ecology **55**: 1135-1141

Bendix, J. 2002: A Satellite-Based Climatology of Fog and Low-Level Stratus in Germany and Adjacent Areas. – Atmospheric Research **64** (1-4): 3-18

Biggs, A. and *P. Cereceda* (eds.) 2007: Proceedings of the Fourth International Conference on Fog, Fog Collection and Dew, Pontificia Universidad Católica de Chile, La Serena (Chile), 22-27 July 2007. – La Serena

Blake, J.V. 1871: The London Fog. – American Naturalist **5** (2): 76-79

Bruijnzeel, L.A., W. Eugster and *R. Burkard* 2005: Fog as a Hydrologic Input. – In: *Anderson, M.G.* and *J.J. McDonnell* (eds.): Encyclopedia of Hydrological Sciences. – Vol. 1. – Chichester et al.: 559-582

Bubb, P., I.A. May, L. Miles and *J. Sayer* 2004: Cloud Forest Agenda. – UNEP World Conservation Monitoring Centre. – Cambridge, U.K.

Burgess, S.S.O. and *T.E. Dawson* 2004: The Contribution of Fog to the Water Relations of *Sequoia Sempervirens* (D. Don): Foliar Uptake and Prevention of Dehydration. – Plant, Cell and Environment **27** (8): 1023-1034

Burkard, R., P. Bützberger and *W. Eugster* 2003: Vertical Fogwater Flux Measurements above an elevated Forest Canopy at the Lägeren Research Site, Switzerland. – Atmospheric Environment **37** (21): 2979-2990. – doi:10.1016/S1352-2310(03)00254-1

Byers, H.R. 1953: Coast Redwoods and Fog Drip. – Ecology **34** (1): 192-193

Cereceda, P., H. Larrain, P. Osses, M. Farías and *I. Egaña* 2008: The Climate of the Coast and Fog Zone in the Tarapacá Region, Atacama Desert, Chile. – Atmospheric Research **87** (3-4): 301-311

Cereceda, P., H. Larrain, P. Osses, M. Farías and *I. Egaña* 2008: The Spatial and Temporal Variability of Fog and its Relation to Fog Oases in the Atacama Desert, Chile. – Atmospheric Research **87** (3-4): 312-323

Cermak, J. and *J. Bendix* 2008: A Novel Approach to Fog/Low Stratus Detection Using Meteosat 8 Data. – Atmospheric Research **87** (3-4): 279-292

Collett, J. L., A. Bator, D.E. Sherman, K.F. Moore, K.J. Hoag, B.B. Demoz, X. Rao and *J.E. Reilly* 2002: The Chemical Composition of Fogs and Intercepted Clouds in the United States. – Atmospheric Research **64** (1-4): 29-40

Collett, J.L., P. Herckes, S. Youngster and *T. Lee* 2008: Processing of Atmospheric Organic Matter by California Radiation Fogs. – Atmospheric Research **87**: 232-241

Dawson, T.E. 1998: Fog in the California Redwood Forest: Ecosystem Inputs and Use by Plants. – Oecologia **117** (4): 476-485

Eugster, W., R. Burkard, F. Holwerda, F.N. Scatena and *L.A.S. Bruijnzeel* 2006: Characteristics of Fog and Fogwater Fluxes in a Puerto Rican Elfin Cloud Forest. – Agricultural and Forest Meteorology **139** (3-4): 288-306. – doi:10.1016/j.agrformet.2006.07.008

Fuzzi, S., M.C. Facchini, S. Decesari, E. Matta and *M. Mircea* 2008: Soluble Organic Compounds in Fog and Cloud Droplets: What Have We Learned over the Past Few Years? – Atmospheric Research **64** (1): 89-98

García-García, F. and *V. Zarraluqui* 2008: A Fog Climatology for Mexico. – DIE ERDE **139** (1-2): 45-59

Gerold, G., M. Schawe and *K. Bach* 2008: Hydrometeorologic, Pedologic and Vegetation Patterns along an Elevational Transect in the Montane Forest of the Bolivian Yungas. – DIE ERDE **139** (1-2): 141-168

Gilliam, H. 1962: Weather of the San Francisco Bay Region. – Berkeley et al.

Glickman, T.S. (ed.) 2000: Glossary of Meteorology. – 2nd edition. – Boston, MA

Gonçalves, F.L T., R.P. da Rocha, G.P. Fernandes and *S. Petto Jr.* 2008: Drizzle and Fog Analysis in the São Paulo Metropolitan Area: Changes 1933-2005 and Correlations with other Climate Factors. – DIE ERDE **139** (1-2): 61-76

Guswa, A.J., A L. Rhodes and *S E. Newell* 2007: Importance of Orographic Precipitation to the Water Resources of Monteverde, Costa Rica. – Advances in Water Resources **30** (10): 2098-2112

Ingraham, N.L. and *R A. Matthews* 1988: Fog Drip as a Source of Ground Water Recharge in Northern Kenya. – Water Resources Research **24**: 1406-1410

Ingraham, N.L. and *R A. Matthews* 1990: A Stable Isotope Study of Fog: The Point Reyes Peninsula, California. – Chemical Geology (Isotope Geoscience Section) **80**: 281-290

Ingraham, N.L. and *R.A. Matthews* 1995: The Importance of Fog-Drip Water to Vegetation: Point Reyes Peninsula, California. – Journal of Hydrology **164** (1): 269-285

Lange, O.L., A. Meyer, H. Zellner and *U. Heber* 1994: Photosyntesis and Water Relations of Lichen Soil Crusts: Field Measurements in the Coastal Fog Zone of the Namib Desert. – Functional Ecology **8** (2): 253-264

Marzol, M.V. and *J.L. Sánchez Megía* 2008: Fog Water Harvesting in Ifni, Morocco. An Assessment of Potential and Demand. – DIE ERDE **139** (1-2): 97-119

Molina, J.M. and *C.M. Escobar* 2008: Fog Collection Variability in the Andean Mountain Range of Southern Colombia. – DIE ERDE **139** (1-2): 125-138

Möller, D. 2008: On the History of the Scientific Exploration of Fog, Dew, Rain and other Atmospheric Water. – DIE ERDE **139** (1-2): 11-44

Montecinos, S., V. Favier, O. Astudillo, Y. Tracol, W. Börsch-Supan, I. Bischoff-Gauß and *N. Kalthoff* 2008: The Impact of Agricultural Activities on Fog Formation in an Arid Zone of Chile. – DIE ERDE **139** (1-2): 77-96

Pounds, J.A. 2001: Climate and Amphibian Declines. – Nature **410**: 639-640

Pounds, J.A., M.R. Bustamante, L.A. Coloma, J.A. Consuegra, M.P.L. Fogden, P.N. Foster, E. La Marca, K L. Masters, A. Merino-Viteri, R. Puschendorf, S.R. Ron, G.A. Sánchez-Azofeifa, C.J. Still and *B.E. Young* 2006: Widespread Amphibian Extinctions from Epidemic Disease Driven by Global Warming. – Nature **439**: 161-167. – doi:10.1038/nature04246

Pounds, J.A., M.P.A. Fogden and *J.H. Campbell* 1999: Biological Response to Climate Change on a Tropical Mountain. – Nature **398** (6728): 611-615

Seely, M.K. and *W.J. Hamilton*, III 1976: Fog Catchment Sand Trenches Constructed by Tenebrionid Beetles, *Lepidochora*, from the Namib Desert. – Science **193** (4252): 484-486

Thalmann, E., R. Burkard, T. Wrzesinsky, W. Eugster and *O. Klemm* 2002: Ion Fluxes from Fog and Rain to an Agricultural and a Forest Ecosystem in Europe. – Atmospheric Research **64**: 147-158

Wanner, H. and *S. Kunz* 1983: Klimatologie der Nebel- und Kaltluftkörper im Schweizerischen Alpenvorland mit Hilfe von Wettersatellitenbildern. – Archives for Meteorology, Geophysics, and Bioclimatology **33** (1-2): 31-56

Weathers, K.C., G.E. Likens, F.H. Bormann, S.H. Bicknell, B.T. Bormann, B.C. Daube, J.S. Eaton, J.N. Galloway, W.C. Keene, K.D. Kimball, W.H. McDowell, T.G. Siccama, D. Smiley and *R.A. Tarrant* 1988: Cloudwater Chemistry from Ten Sites in North America. – Environmental Science and Technology **22** (9): 1018-1026

Weathers, K.C., G.M. Lovett, G.E. Likens and *N.F.M. Caraco* 2000: Cloudwater Inputs of Nitrogen to Forest Ecosystems in Southern Chile: Forms, Fluxes and Sources. – Ecosystems **3**: 590-595

Summary: Fog Research

The triennial Conferences on Fog, Fog Collection and Dew provide a platform for worldwide scientific exchange among fog researchers and those interested in fog collection. The 2007 conference was held in La Serena, Chile. A selection of contributions covering geographical aspects of fog research or providing insight into fog collection projects has been included in this special issue of DIE ERDE. This introductory paper provides the scientific background of the topic, including the definition of fog, the types of fog, and the relevance of fog in research, which also provides an overview over the breadth of contemporary fog research. Then, the articles included in this special issue are briefly introduced and put into context. In the conclusion the author addresses the potential for extending research efforts particularly in fog collection projects to cover the human dimensions aspects of fog collection.

Zusammenfassung: Nebelforschung

Die alle drei Jahre stattfindenden „Conferences on Fog, Fog Collection and Dew“ bieten den weltweit tätigen Nebelforschern und den Wissenschaftlern, die sich mit dem Sammeln von Nebelwasser beschäftigen, eine gemeinsame Plattform zum Austausch ihrer wissenschaftlichen Erkenntnisse. Die letzte Konferenz fand 2007 in La Serena (Chile) statt. Eine Auswahl der Beiträge, die auf geografische Aspekte der Nebelforschung eingingen oder einen Einblick in die Forschungsarbeiten im Rahmen von Nebelwassergewinnungsprojekten bieten, wurde in dieses Sonderheft der ERDE aufgenommen. Der vorliegende Einführungsartikel befasst sich mit dem wissenschaftlichen Hintergrundwissen, das für das Verständnis der Artikel vorausgesetzt wird. Im Speziellen wird auf die Definition von Nebel eingegangen, auf die in der Wissenschaft üblicherweise verwendeten Begrifflichkeiten bei der Bezeichung verschiedener Nebeltypen, und schließlich auf die Bedeutung des Nebels in der Forschung. Dieser letzte Abschnitt zeigt zugleich auch die Breite der aktuellen Nebelforschungsarbeiten auf. Anschließend werden die im Sonderheft aufgenommenen Artikel kurz eingeführt und in den Zusammenhang der Nebelforschung gestellt. In den Schlussfolgerungen erwähnt der Autor das Potenzial, das in einer zukünftigen Ausweitung der Forschungsarbeiten liegen würde, wenn bei Nebelwassergewinnungsprojekten auch die humangeographischen Aspekte systematisch untersucht würden.

Résumé: La recherche sur le brouillard

Les conférences triennales sur le brouillard, la collecte du brouillard et la rosée (« Conferences on Fog, Fog Collection and Dew ») fournissent aux chercheurs dans le domaine du brouillard actifs dans le monde autant qu’aux scientifiques intéressés par la collection de l’eau de brouillard une plateforme commune pour l’échange de leurs résultats scientifiques. Le dernier colloque s’est tenu en 2007 à La Serena au Chili. Une sélection des contributions portant sur les aspects géographiques de la recherche sur le brouillard ou donnant un aperçu des travaux de recherche menés dans le cadre des projets de collecte de brouillard est incluse dans ce numéro spécial de DIE ERDE. Cette introduction présente la base scientifique du sujet, dont la connaissance est une condition préalable à la compréhension des articles. En particulier, la définition du brouillard est traitée ainsi que les notions utilisées pour la désignation des divers types de brouillard et, finalement, l’importance du brouillard dans la recherche. Cette dernière partie montre aussi l’ampleur de la recherche contemporaine sur le brouillard. Ensuite, les articles inclus dans ce numéro spécial sont brièvement présentés et placés dans le contexte de la recherche sur le brouillard. Dans ses conclusions, l’auteur évoque le potentiel qui consisterait à étendre de manière systématique les travaux de recherche sur les projets de collecte de l’eau de brouillard à la dimension de la géographie humaine.

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