

Contents

Preface	v
Contents	vii
List of Contributors	xiii
1 TROPOSAT: the project and the scientific highlights	1
Peter Borrell, John P. Burrows and Ulrich Platt	
1.1 Introduction	1
1.2 The aims of TROPOSAT	2
1.3 Some TROPOSAT scientific highlights and activities	2
1.4 Policy-relevant results	7
1.5 Future perspectives and opportunities	9
1.6 TROPOSAT organisational activities	11
1.7 Further information	12
2 An Overview of the Scientific Activities and Achievements	13
2.1 New algorithms for obtaining tropospheric data from satellite measurements	13
Andreas Richter and Thomas Wagner	
2.2 Applications of satellite data in tropospheric research	29
Martin Dameris	
2.3 Synergistic use of different instrumentation and platforms for tropospheric measurements	35
Paul S. Monks and Herman G.J. Smit	
2.4 Validation and data assimilation for tropospheric satellite data products	43
H.M. Kelder, R.F. van Oss, A. Piter and H. Eskes	
2.5 The use of data assimilation to augment the utility of satellite data	47
Hendrik Elbern	
2.6 Future space infrastructure	51
Albert P.H. Goede	
2.7 Tropospheric Data from the United States	55
Jerry Ziemke	
3 Development of Algorithms	59
3.1 Retrieval of Greenhouse and Related Gas Parameters from SCIAMACHY/ENVISAT	59
Albert P.H. Goede	

3.2	Aerosol Retrieval by the Introduction of New Aerosol Classes and Optical Properties: Methods and Climatology	65
	Rodolfo Guzzi, W. Di Nicolantonio, G. Ballista and E. Carboni	
3.3	Neural Network Ozone Profile Retrieval System for GOME Spectra (NNORSY-GOME)	77
	A.K. Kaifel, M.D. Müller, M. Weber and S. Tellmann	
3.4	Retrieval and Data Assimilation Algorithm Development for Tropospheric Ozone and NO₂ from GOME and SCIAMACHY	87
	R.J. van der A, F. Boersma, H.J. Eskes, J.I. van Gent, H.M. Kelder, P. Levelt, A.J. Segers, R.F. van Oss, G. van Soest and P.J.M. Valks	
3.5	Retrieval of Tropospheric Aerosol Properties from Space using MISR Data	97
	Johannes Keller	
3.6	The Role of Polarisation Measurements in Ozone Profile Retrieval from Back-scattered Ultraviolet Sunlight	107
	Jochen Landgraf and Otto P. Hasekamp	
3.7	Retrieval of Aerosol Properties from Satellite Data	117
	Gerrit de Leeuw, Jolanta Kusmierczyk-Michulec, Cristina Robles Gonzalez and Rob Decae	
3.8	Retrieval of CO Column and Profile Data from the MOPITT Instrument on EOS-TERRA	125
	John J. Remedios and Nigel A.D. Richards	
3.9	Quantification of Tropospheric Measurements from Nadir Viewing UV/Visible Instruments	137
	Andreas Richter, Hendrik Nüß, Björn-Martin Sinnhuber, Thomas Wagner and John P. Burrows	
3.10	Retrieval of Upper Tropospheric H₂O from CRISTA-2 Observations	149
	Bernd Schäler and Martin Riese	
3.11	Retrieval of Tropospheric BrO and NO₂ from UV-Visible Observations	155
	Michel Van Roozendaal, C. Fayt, P. Post, C. Hermans and J.C. Lambert	
3.12	Retrievability of Upper Tropospheric Species and Parameters from MIPAS/ENVISAT Data	167
	Gabriele P. Stiller, Thomas von Clarmann, Norbert Glatthor, Michael Höpfner, Sylvia Kellmann, Evelyn Kimmich, Andrea Linden, Mathias Milz, Tilman Steck, and Herbert Fischer	
3.13	Assessment of the Global Distribution of Tropospheric OH Radical Production from GOME Observations	181
	Olaf N.E. Tuinder	
3.14	A Ground Validation Station for the Satellite-based Atmospheric Sensor Instruments GOME and SCIAMACHY	187
	Arnolds Ubelis, Edgars Smalins, Uldis Gross and Janis Pukite	

3.15	Development of Satellite-derived Information on Tropospheric Actinic Flux and Aerosol Particulate Matter	189
	Jean Verdebout, Régis Borde and Peter Vogt	
3.16	Case Studies for the Investigation of Cloud Sensitive Parameters as Measured by GOME	199
	Thomas Wagner, Andreas Richter, Christoph von Friedeburg, Mark Wenig and Ulrich Platt	
3.17	Ozone Profile Retrieval from Broadband Nadir UV/Visible Satellite Spectra: How Accurate is the Tropospheric Profile?	211
	Mark Weber, Klaus Bramstedt, Lok Lamsal, Sandip Dhomse, Arief Darmawan, Kai Eichmann, Astrid Bracher, Silvia Tellmann, Vladimir Rozanov and John Burrows	
4	Use of Satellite Data to understand Atmospheric Processes	227
4.1	Tropospheric Aerosol Modelling.....	227
	Maarten van Loon and Peter Builtjes	
4.2	Validation of a Fully Coupled Chemistry-Climate Model	231
	Martin Dameris and Axel Lauer	
4.3	Global Photochemical Model Evaluation using GOME Tropospheric Column Data	241
	Mark G. Lawrence, T. Kunhikrishnan and Rolf von Kuhlmann	
4.4	Construction and Analysis of Image Sequences of Atmospheric Trace Gases	251
	Mark Wenig, Thomas Wagner, Ulrich Platt and Bernd Jähne	
4.5	Use of GOME Measurements for the Examination of the Nitrogen Oxide Budget in the Troposphere	255
	Franz Rohrer, Olaf Stein and Nicola Toenges	
4.6	Use of Satellite Data to Constrain Ozone Budgets in Global Tropospheric Chemistry Models.....	259
	N.H. Savage, A. Richter, F. Wittrock, A. Ladstaetter-Weissenmayer, G. Edwards, J. Remedios, K. Law, F. O' Connor, J.A. Pyle and J.P. Burrows	
4.7	First Validation of Tropospheric NO₂ Column Densities Retrieved from GOME by <i>in situ</i> Aircraft Profile Measurements	265
	Jörg Heland and Hans Schlager in cooperation with Andreas Richter and John P. Burrows	
4.8	Determination of NO_x Sources by Combination of Satellite Images with Transport Modelling.....	271
	Andreas Stohl, Nicole Spichtinger, Steffen Beirle, Mark Wenig, Thomas Wagner and Ulrich Platt	
4.9	The Use of Space-borne Measurements and the Ground-based Swiss Monitoring System for Tracing Atmospheric Pollution	281
	Andrea Weiss, Daniel Schaub and Peter Hofer	

5	Synergistic Use of Different Instrumentation and Platforms for Tropospheric Measurements	291
5.1	Comparing CARIBIC and Satellite Data	291
	Carl A.M. Brenninkmeijer, Franz Slemr, Andreas Zahn and P. Zimmermann	
5.2	Studies of NO₂ from Lightning and Convective Uplifting using GOME Data	297
	John P. Burrows, Andreas Richter and Lars Hild	
5.3	Scientific Applications of Satellite Data within the <i>Geophysics Research Community</i>	307
	A.R. MacKenzie and L. Stefanutti	
5.4	Retrieval of Tropospheric Information from Ground-based FTIR Observations, Supported by Synergistic Exploitation of Various Ground-based and Space-borne Measurement Techniques and Data	315
	Martine De Mazière and B. Barret	
5.5	The Development of Multi-platform Methods for Derivation of Tropospheric Composition from Space.....	327
	Roland J. Leigh, Gary K. Corlett and Paul S. Monks	
5.6	Control Mechanisms of Water Vapour in the Upper Troposphere: Large Scale Subsidence in Regions of Tropical Cb-Convection	337
	Herman G.J. Smit, Susanne Nawrath, Dieter Kley and Manfred Helten	
5.7	Satellite plus Ground-based FTIR Measurements for Tropospheric Studies: Towards an Integrated Global Measurement System (IGMS) and an Improved Validation Strategy	345
	Ralf Sussmann	
5.8	Methodology for Using the MOZAIC Ozone Climatology in Future Comparisons with Data from SCIAMACHY Onboard ENVISAT	355
	Régina Zbinden, Bastien Sauvage, Valérie Thouret, Philippe Nédélec, Gilles Athier, Jean Pierre Cammas and Jean Luc Attié.	
6	Validation and Data Assimilation for Tropospheric Satellite Data Products	361
6.1	Validation of CO and CH₄ Retrieved from SCIAMACHY	361
	Anne Grete Straume, Ilse Aben, Henk Eskes, John Gille, Maarten Krol, Ahilleas Maurellis, Jan Fokke Meirink, Hans Schrijver and Michiel van Weele	
6.2	Database Support for Use and Usability of Satellite Data	373
	Bill Arlander	
6.3	Emission Rate Estimates by Variational Assimilation of Surface and Satellite Data.....	375
	Hendrik Elbern	

6.4	Satellite Validation using Ground-based Spectroscopic Techniques	381
	Bo Galle, Johan Mellqvist and Anders Strandberg	
6.5	Airborne <i>in-situ</i> Measurements of Radiation, Aerosol Optical Properties and Trace Gases for Evaluation of Remote Sensing Techniques	391
	Wolfgang Junkermann	
6.6	Co-ordination of the Validation Activities for SCIAMACHY.....	397
	H. Kelder, U. Platt, P. Simon, A. Pitters, R. Timmermans, I. Aben, K. Bramstedt, J.P. Burrows, C. Camy-Peyret, E. Hilsenrath, B. Kerridge, B. Kirchhoff, K. Künzi, J.-C. Lambert, D. Perner, M. Riese, H. Smit, J. Staehelin and D. Swart	
6.7	A New Airborne DIAL System for Tropospheric Ozone Measurements.....	401
	Alexander Meister and Harald Flentje	
6.8	Monitoring of the Variability and Long-term Evolution of Tropospheric Constituents by Infrared Solar Absorption Spectrometry at the Jungfraujoch, Switzerland	407
	Rodolphe Zander, Emmanuel Mahieu, Pierre Duchatelet, Philippe Demoulin, Francine Mélen and Christian Servais	
	Appendix 1 Tropospheric satellite data available.....	417
	Appendix 2 Publications and Theses resulting from TROPOSAT work ...	421
	Appendix 3 Organisation of TROPOSAT	435
	Index	439

Sounding the Troposphere from Space

A New Era for Atmospheric Chemistry

Borrell, P.; Borrell, P.M.; Burrows, J.P.; Platt, U. (Eds.)

2004, XXIX, 446 p., Hardcover

ISBN: 978-3-540-40873-4