Overview of the ACRIDICON-CHUVA aircraft project

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> February 29 - March 03, 2016 Ilhabela - SP - Brazil



ACRIDICON–CHUVA flights

Manaus, 6 September - 1 October 2014



- 14 scientific flights, 96 flight hours
- 40 additional flight hours for electromagnetic noise and instrument testing (AC01 to AC04) and transfer Germany to Manaus (AC05, AC06) and back to Germany (AC21 and AC22)



Flight tracks for all scientific missions (AC07 to AC20), Wendisch, 2016



Flight altitude above mean sea level (above sea level, asl) plotted as a function of time (hour after midnight, UTC) for all scientific missions (AC07 to AC20), Wendisch, 2016

- Half of the flights took more than seven hours
- Maximum altitude 15km

Five scientific topics :

- a. cloud vertical evolution and life cycle (cloud profiling) (8 flights)
- b. cloud processing of aerosol particles and trace gases (inflow and outflow)[±] (3 flights)
- c. satellite and radar validation (cloud products) (3 flights)
- d. vertical transport and mixing (tracer experiment) (2 flights)
- e. cloud formation over forested/deforested areas (1 flight)

#	Date in 2014	Research Topic	Ceiling Altitude	Time Span	Remark
			(km)	(Hours)	
AC07	06 September	a	13.9	07:35	Test of Flight Strategy
AC08	09 September	a	13.8	05:30	Coordinated with G1
AC09	11 September	a	12.6	06:10	Clean Conditions
AC10	12 September	с	14.4	07:25	Along A-Train Path
AC11	16 September	b, d	12.9	07:25	Tracer Experiment
AC12	18 September	a	13.8	06:15	Polluted Conditions
AC13	19 September	a	12.9	06:30	Polluted Conditions
AC14	21 September	с	15.2	07:15	Coordinated with G1
					Along A-Train Path
AC15	23 September	c, b	13.8	07:20	Along A-Train Path
AC16	25 September	b, d	13.2	06:50	Tracer Experiment
AC17	27 September	e	8.1	06:40	Comparison with GPM
AC18	28 September	a	14.4	06:50	Clean Conditions
AC19	30 September	a	13.8	07:15	Marine Conditions
AC20	01 October	b, a	14.4	07:05	Coordinated with G1

Instrumentation



3x TGI (Trace Gas Inlet)

HALO-CVI

(Counterflow Virtual Inlet)

HASI

(HALO Aerosol Submicrometer Inlet)

SMART

(Spectral Modular Airborne Radiation Measurement System)

HAI

(Hygrometer for Atmospheric Investigations)



HASI



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AENEAS ନେମ୍ଲି**ମାଡଡ଼** / SP2 FINCH Spectral radiance to derive trace gas concentrations: HCHO, BrO, IO,





cloud ice crystals & cloud droplets

Onboard cameras



3	view upward					
4	Cockpit-Cam; forward					
6 View downward (under HALO)						
8	View vertically downward					
11	Tail-Cam over HALO in forward direction					
15	Enhanced Vision (= Infrarot-Cam in the nose), not					
15	always active but during flight through clouds					

Flight AC20 (cloud profiling + inflow and outflow)





Flight, Date	Camera 4
AC01 2208	no videos
AC02 2408	no videos
AC03 2708	no videos
AC04 2708	no videos
AC05 0109	no videos
AC06 0209	no videos
AC07 0609	up to 520 mins
AC08 0909	few selected
AC09 1109	up to 450 mins
AC10 1209	up to 520 mins
AC11 1609	up to 590 mins
AC12 1809	up to 530 mins
AC13 1909	up to 640 mins
AC14 2109	up to 540 mins
AC15 2309	up to 570 mins
AC16 2509	up to 490 mins
AC17 2709	up to 490 mins
AC18 2809	up to 300 mins
AC19 3009	up to 600 mins
AC20 0110	up to 540 mins
AC21 0310	up to 230 mins.
AC22 0410	up to 430 mins.

HALO data base (https://halo-db.pa.op.dlr.de/)

Instrument	AC05_0109	AC06_0209	AC07_0609	AC08_0909	AC09_1109	AC10_1209	AC11_1609	AC12_1809	AC13_1909	AC14_2109	AC15_2309	AC16_2509	AC17_2709	AC18_2809	AC19_3009	AC20_0110	AC21_0310	AC22_0410
AENEAS							on demand										on de	mand
AMETYST_CPC0																		
AMETYST_CPC3																		
AMETYST_CPC1																		
AMTEX_CO																		
AMTEX_03																		
BAHAMAS																		
C-ToF-AMS																		
CAS-DPOL																		
CCNC_A_CVI																		
CCNC_A:HASI																		
CCNC_B_CVI																		
CCNC_B_HASI																		
SP2							со	mming soo	on									
CCP-CDP																		
CCP-CIPG																		
FINCH																		
HAI																		
HALO_CVI																		
miniDOAS																		
МТР																		
NIXE-CAPS																		
PCASP																		
PHIPS_Camera1																		
PHIPS_Camera2																		
PIP																		
SHARC																		
SID3a																		
SMART⁰																		
SpecMACS						access ca	in be grant	ed, please	contact to	bias.koelli	ng@physil	k.uni-muei	nchen.de					
SNOOPY	on demand																	
UHSAS-A																		
Flexpart																		
	no data until now ACRIDICON-CHI IVA-Homenage																	
	no data																	
		orelimanar	y	http://www.uni-leipzig.de/~meteo/acridicon-chuva/														
	trus	ted / final	data															

External researchers who would like to use the ACRIDICON-CHUVA data need to contact the investigators directly

ACRIDICON-CHUVA:

Aerosol, Cloud, Precipitation, and Radiation Interactions and Dynamics of Convective Cloud Systems

Cloud processes of the main precipitation systems in Brazil: A contribution to cloud resolving modeling and to the GPM (GlobAl Precipitation Measurement) Manaus, Brazil, September 2014

ACRIDIC	ON-CHUVA	Workshop	ACRIDICON-CHUV	A— Tropical Convective Clouds and Aerosol under Inv	estigation				
29.2-3.3.2016, II	lha Bela (Brazil)								
Schedule and Abstracts as of 18. Feb. 2016									
The ACRIDICO	ON-CHUVA campa			V DLR					
tropical deep co	onvective clouds and	I		HALO-Instrumentation of ACRIDICON-CHUVA					
over Amazonia	using the new Gern		Instrument	Measured Quantity	Responsible Institution, contact				
Bullatin of the	accepted for publica	Inlets							
10 1175/BAMS	D-14-00255 1	CVI		Iniet for Cloud Particles and Kestulues of size 3-30 µm	TROPOS, Stephan Mertes, contact				
10.11/0/0/10/10/0	-D-14-00255.1.	HASI		Submicrometer Aerosol Inlet for aerosols of size < 1 µm	DLR				
		IGI		Trace Gas Inlet					
Collection	of links	Instruments Measuring	Aerosols						
concention	of mins	AMETYST (Aerosol ME	(asuremen I SYSTem)	Particle Concentrations and Size Distributions of Total and Non-volatile Aerosol 5-300 nm and 250 nm-3µm, Aerosol Absorption	DLK				
. ACPIDIC	ON White Paner	C-ToF-AMS (Compact T	ime-of-Flight Aerosol Mass Spectrometer)	Quantitative Mass Concentration of Non-refractory Aerosol Compounds of Aerosol Ensembles	MPIC				
Data and	Data Protocol	CPC		Kesidual Particle Number Concentration, 10 nm - 3 µm	IROPOS, Stephan Mertes, <u>contact</u>				
· A campai	gn blog (external lin	PSAP		Kesdual Particle Absorption Coefficient, lambda = 56/ nm	TROPOS, Stephan Mertes, <u>contact</u>				
• Instrume	ntation	UHSAS		Kesidual Particle Size Distribution, 60 nm - 1 µm	TROPOS, Stephan Mertes, contact				
 Forecast and Satellite Links 		Electrometer		Drop Charge	TROPOS, Stephan Mertes, contact				
		FINCH (Fast Ice Nucleation Chamber)		Lee Nucleating Particles	Uni Frankfurt, <u>contact</u>				
For Participants	(password required)	CCN-Rack (CCN und SP	-2)	CCN Concentration	MPIC				
Measurements at the ATTO		SNOOPY (Single-Partic	le SOOt Photometer S I stem)	Black Carbon Size Distribution, Particle Size Distribution 80-500 nm	DLK				
• General H	light Information (Instruments Measuring	Trace Gases						
paths, inc	l. quicklooks)	AENEAS (Atmospheric	Nitrogen Oxides MEAsuring System)	NO, NO ₂ , S pmo/mol - 60 nmol/mol					
 Campaigner 	n-Quicklooks (instru	AMIEX		Carbon Monoxide, Ozone, Pertluorocarbons					
 Forms an 	d further Informati	HAI (Hygrometer for Att	mospheric Investigations)	Water Vapor	PIB, FZJ				
 Data Meeting, Mainz, March 		ITMS		PAN, Organic Acids, SO ₂ , HNO ₃	DLR				
• Fotos		PERTRAS		PFCs, Perfluorocarbon	DLR				
		Remote Sensing Instrum	nents						
		specMACS		Cloud Side Reflected Radiances	Uni München, Uni Leipzig, MPIC, contact				
		miniDOAS (mini Differe	ntial Optical Absorption Spectroscopy)	2D Detection of UV/visible/nearIR Absorbing Gases in Nadir and Scanning Limb Observation Modes	Uni Heidelberg				
		SMART (Spectral Modul	lar Airborne Radiation Measurement System)	Spectral Irradiance (Up- and Downward), Spectral Radiance (Upward)	Uni Leipzig, <u>contact</u>				
Time Line		Probes Mounted Under	neath the Wings						
oversite evit was relief brief of the Sk		CAS-DPOL (Cloud and Aerosol Spectrometer with Detector for POLarization)		Aerosol, Cloud Droplet or Ice Crystal Concentration and Size Distribution, 0.6-50µm; Backscatter Polarization, Cloud Liquid Water Content	DLR				
		CP (Cloud Combination Probe)		Concentration and Size of Aerosol Particles, Cloud Droplets or Ice Crystals, 3.0-50 µm, 15 µm-0.9 mm	Uni Mainz, MPIC, <u>contact</u>				
	Workshop	Hotwire LWC		Cloud liquid water content, 0.01 – 3 g m ⁻³	DLR				
		MTP (Microwave Tempe	erature Profiler)	Passive Microwave Radiometer Measuring the Natural Thermal Emission of Oxygen at 3 Frequencies	DLR				
	Aerosol-	NIXE-CAPS (Novel Ice]	Experiment-Cloud and Aerosol Spectrometer)	Concentration and Size of Aerosol Particles, Cloud Droplets or Ice Crystals, 0.5-50 µm, 15 µm-0.9 mm, Backscatter Polarization	FZJ, contact				
		PCASP-100X (Passive C	avity Aerosol Spectrometer Probe)	Aerosol Particle Concentration and Size Distribution, 120nm-3µm	DLR				
		PHIPS (Particle Habit Im	aging and Polar Scattering Probe)	Cloud Droplets or Ice Crystal Size Distribution, 5-800 µm, Scattering Phase Function, Particle Shape, 3D Morphology	KIT				
		PIP (Precipitation Imagin	ng Probe)	Large Cloud Droplet or Ice Crystal Size Distribution, 100 µm- 6 mm	Uni Mainz, MPIC, contact				
		SID-3 (Small Ice Detecto	n)	Aerosol Particle, Cloud Droplet and Ice Crystal Concentration and Size, 2-140 µm, Particle Shape	KIT				
		UHSAS-A (Ultra-High S	ensitivity Aerosol Spectrometer)	Aerosol Particle Concentration and Size Distribution, 60nm-1µm	DLR				

ACRIDICON-CHUVA Data Protocol and Publication

- Users of unpublished data should contact the data providers well in advance of producing and submitting a manuscript, in order to inform the providers of intended use
- Where data are used for modeling or integrating studies, the scientist collecting the data will be credited, either by co-authorship or by citation.
- The data collectors should be informed of publication plans well in advance of submission of a paper, given an opportunity to read the manuscript, and be offered co-authorship. In cases where data from other investigators are a minor contribution to a paper, the data should be referenced by a citation.
- <u>http://www.uni-leipzig.de/~meteo/acridicon-chuva/DataProtocol.html</u>