

# **MEGAMex**

## **Measurements of the Emissions of Gases and Aerosols from Mexico**



**Izta-Popo National Park, State of Mexico  
November 12, 2005 – January 1, 2008**

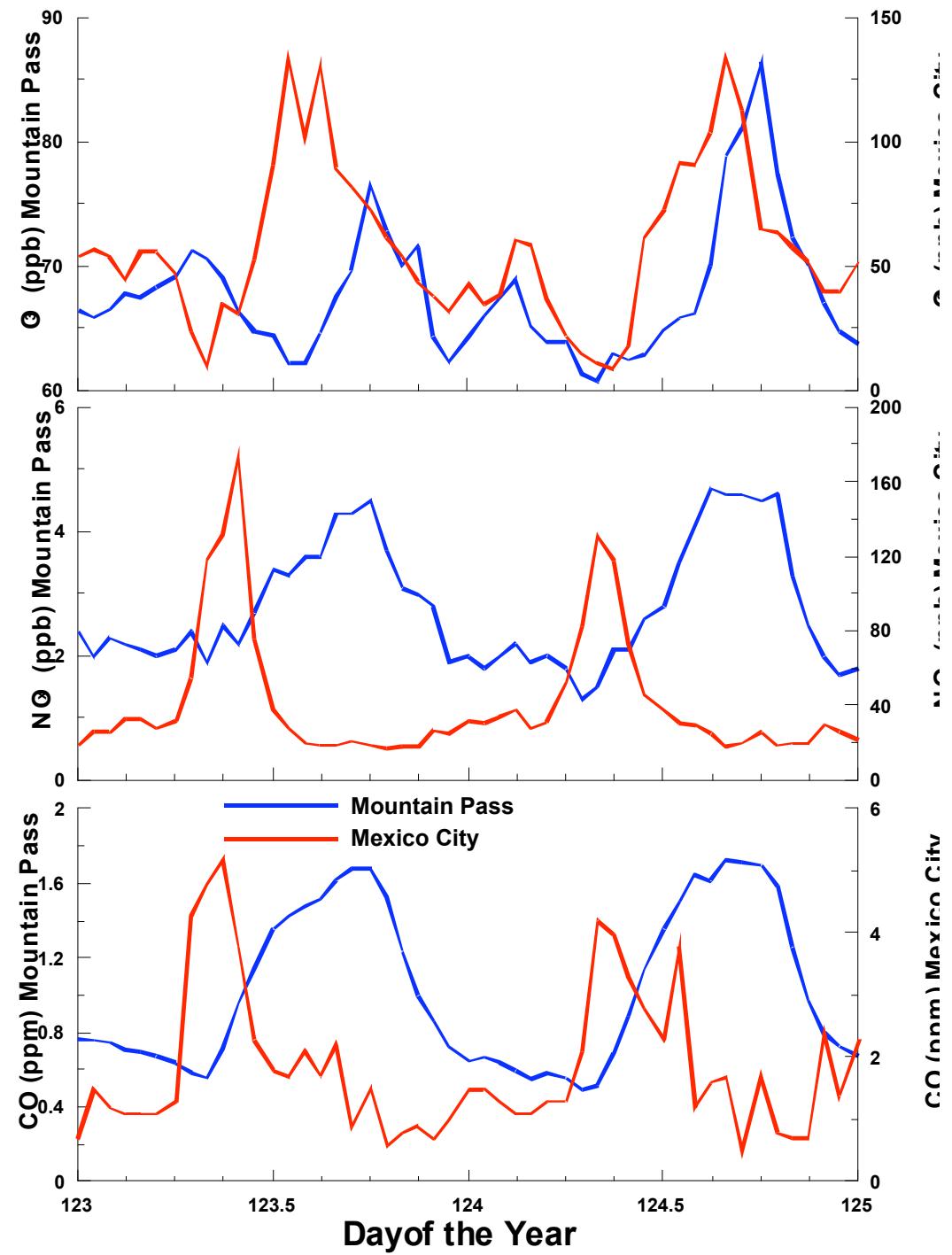
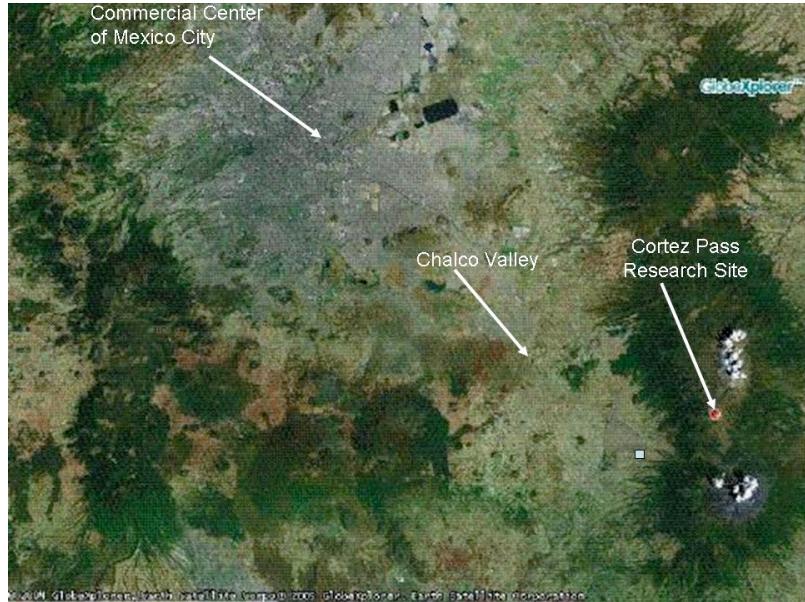
## Research Questions

- 1) What are the rates of turbulent exchange of momentum, energy, latent heat, CO<sub>2</sub> and particles within the Mexico City boundary layer?**
- 2) What is the deposition flux of particles in the surface layer at the national park of Izta-Popo Zoquiapan?**
- 3) How do the properties of particles emitted from Mexico City change with age and photochemical processing?**
- 4) How do the hygroscopic properties of particles emitted from Mexico City impact the properties of clouds and precipitation?**
- 5) Is there an indication for nucleation from biogenic precursors or volcanic sources?**
- 6) How do the optical properties of particles emitted from the Mexico City area alter radiative fluxes?**

## Research Objectives

- 1) Measure the properties of aerosol particles and trace gases at the Cortez Pass during a two year period to evaluate diurnal and seasonal variations.
- 2) Participate in the Megacity Impact on Regional and Global Environment (MIRAGE) field campaign with an expanded set of instrumentation and aircraft.
- 3) Compare the measurements at the Cortez Pass with those from the C-130 and Enduro microlight.
- 4) Closure studies using in situ measurements of radiation and particle physical properties from vertical profiles measured with lidar, aircraft and ground based instrumentation (German lidars and aircraft)
- 5) Utilize the measurements in micrometeorological, radiative transfer and cloud models to evaluate the effect of anthropogenic emissions on the ecosystems, climate and clouds of local and regional areas.
- 6) Develop a Global Atmospheric Watch (GAW) regional monitoring station for long term measurements of greenhouse gases and anthropogenic aerosols.

Measurements from April 26 to May 11, 1999  
by the mobile monitoring station of RAMA in  
the Cortez Pass, 4000 m



**View from the Cortez Pass**



**9 am, March 12, 2005**



**11 am, March 12, 2005**

**View from Iztacíhuatl**



**9 am, April 16, 2005**



**9 am, April 16, 2005**



### Alzomoni Measurement Station

#### 16 m flux tower

Momentum

Heat

CO<sub>2</sub>

CN

PSD

O<sub>3</sub>

#### Radiation

Global Diffuse

UV

Actinic Flux

#### Gases

CO, CO<sub>2</sub>, SO<sub>2</sub>, O<sub>3</sub>, CH<sub>4</sub>

N<sub>2</sub>O, NH<sub>3</sub>, NO, NO<sub>2</sub>, H<sub>2</sub>CO

Column SO<sub>2</sub>, NO<sub>2</sub>, O<sub>3</sub>

VOC

PAN, PPN

#### Particles

CN

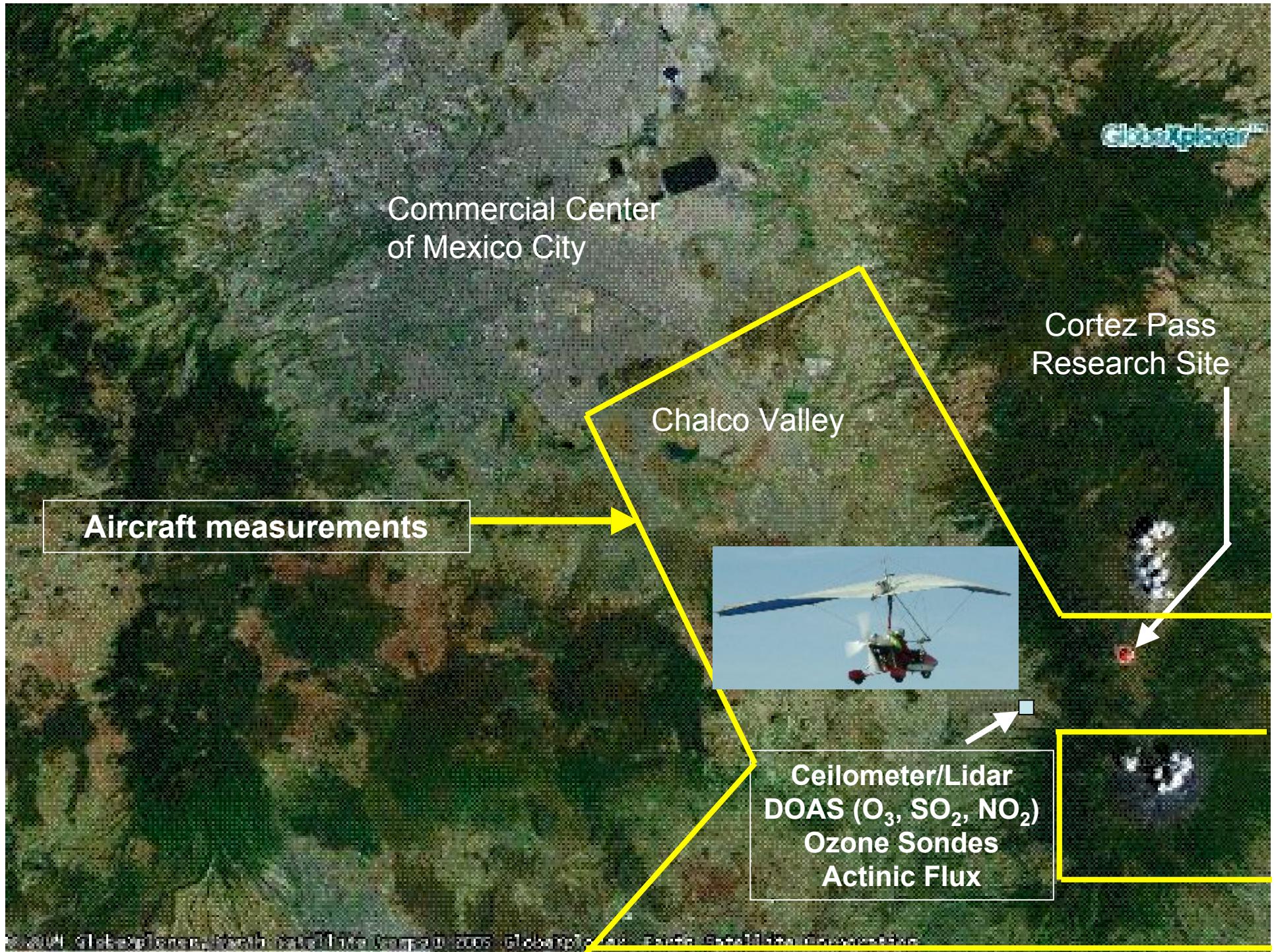
CCN

B<sub>scat</sub>, B<sub>abs</sub>

BC/EC/OC

PPAH

PSD



Aircraft type:  
 Aircraft identification:  
 Cruise Speed  
 Max Altitude  
 Climb rate (m/s)  
 Endurance (max)  
 Total payload  
 Wing span / area  
 Electrical power  
 C-Mode Transponder

### Ultralight Enduro

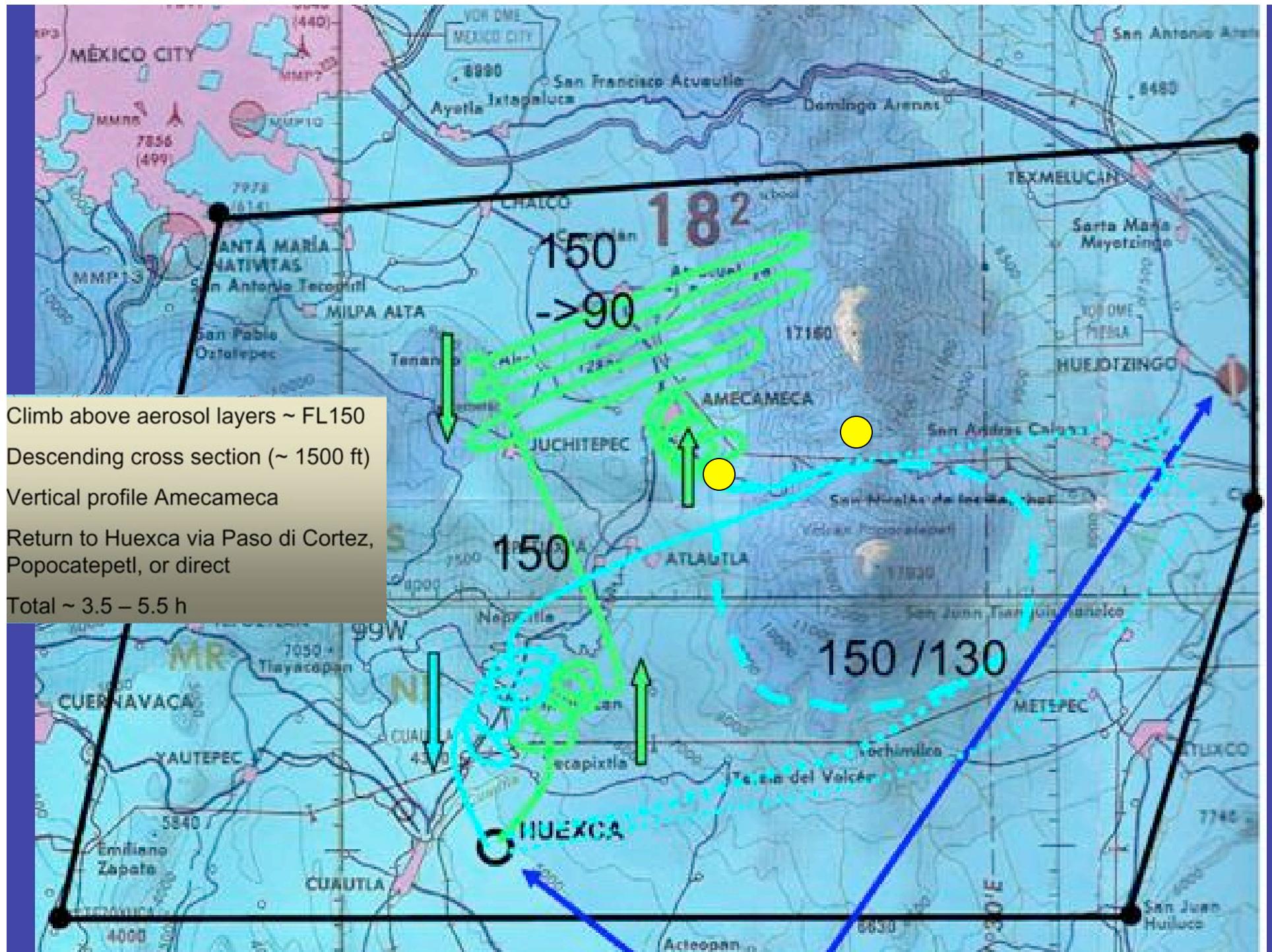
#### D-MIFU

50 kts  
 >15000 ft  
 1000 ft/min (MSL)  
 7 h  
 200 kg incl. pilot  
 10 m, 17 m<sup>2</sup>  
 600 W 12 VDC, 24 VDC



### Instrumental installations for MIRAGE MEX

Parameter	Instrument	time-resol.	remarks	Clouds, aerosols and radiation
Ozone	UV-Photometer	2 sec,	DL 2 ppb	
CO2	OPA IR absorption	10 Hz		
H2O	OPA IR absorption	10 Hz		
VOC	absorption tubes C5-C15	30 min	selected compounds	
Act. Rad. 300 nm $J_{O1D}$	2 Filterradiometers	1 sec,	↑↓ up and down	
Act. Rad. 380 nm $J_{NO2}$	2 Filterradiometers	1 sec,	↑↓ up and down	
Global radiation	2 LICOR Pyranometers	1 sec	↑↓ up and down	
UV-B	2 UV-B Sensors	1 sec	↑↓ up and down	
Temperature	Pt 100	2 sec,	0.1 degree	
Humidity	Chilled mirror	2 sec,	0.1 degree	
Pressure		1 sec,	0.1 hPa	
Position	GPS	2 sec,	acc. 2 m	
Wind (horizontal)	GPS/Compass/INS	10Hz,	prec. 0.5 m/sec	
CNC / number	TSI 3010	1 sec	> 0.01 - 3 µm,	
Aerosols / number	METONE 4903, 2 channels	2 sec	> 0.3, > 0.5 µm	
Aerosols / size distr.	Aerosol Spectrometer, 15 ch.	6 sec	> 0.3- 20 µm	
Submicron aerosol size distr. (SMPS/FCE)		2 min	10 - 500 nm	
Scatt. coeff. / visibility	HSS-AVMIII	1 sec	870 nm, 0-60 km	
Absorption coefficient	Magee Aethalom.	2 min	350 - 95 nm equiv. to BC [ng]	
Turbulence, 3D windvector	5 hole noseboom probe	10 Hz	> 0.1 m/sec	
Attitude / Heading	Oxford Tech. INS	100 Hz	acc. 0.1 / 0.6 degree	
Graphic documentation	2 digital cameras	3 sec	looking → and ↓	Biomass burning HCHO + aerosol



# Participants\*

## UNAM

### Researchers

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