Jetstream-31 Flight Operations

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INTEX MRR
NASA Ames
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J31 Science Objectives in INTEX-ITCT-ICARTT

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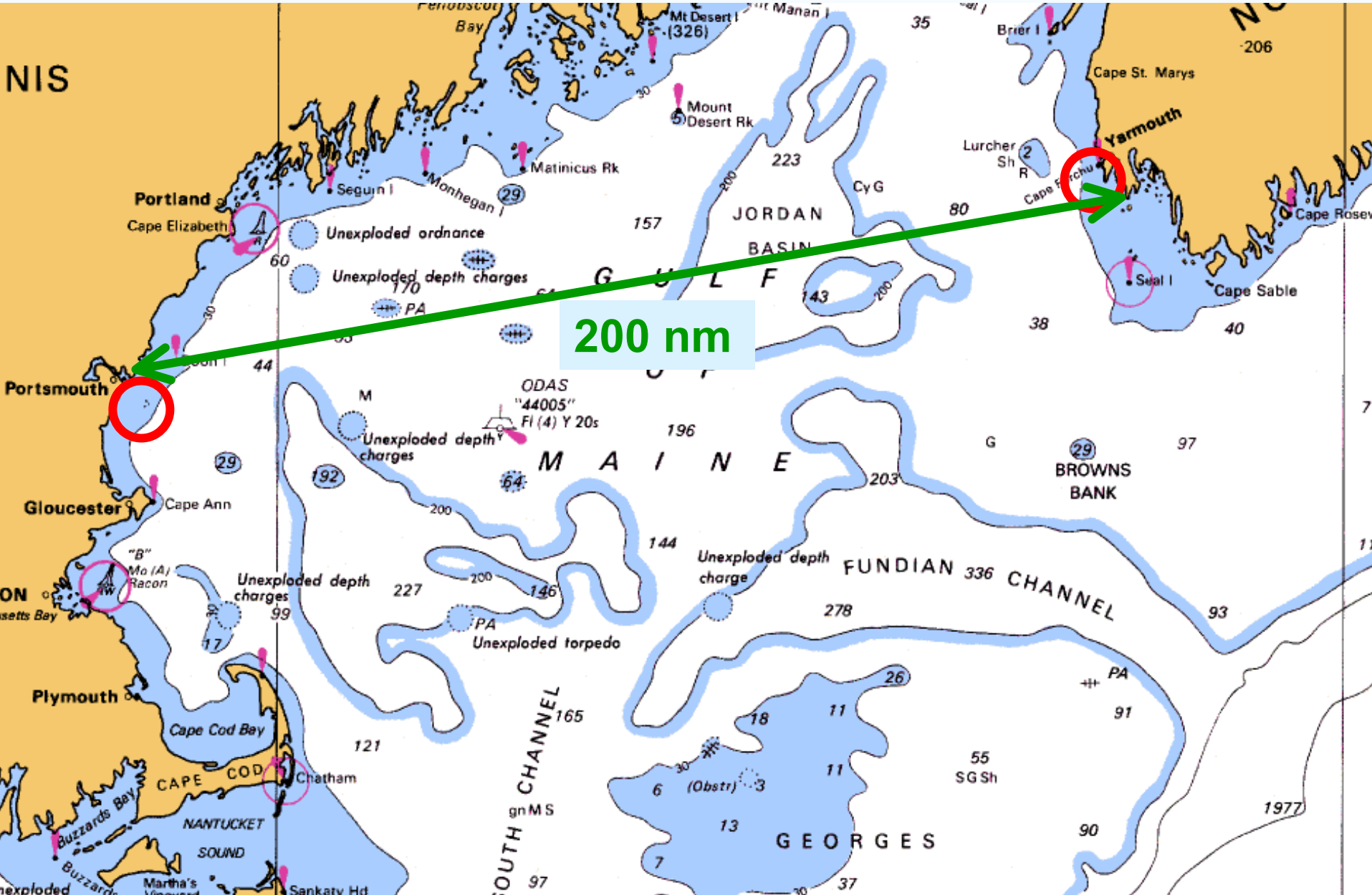
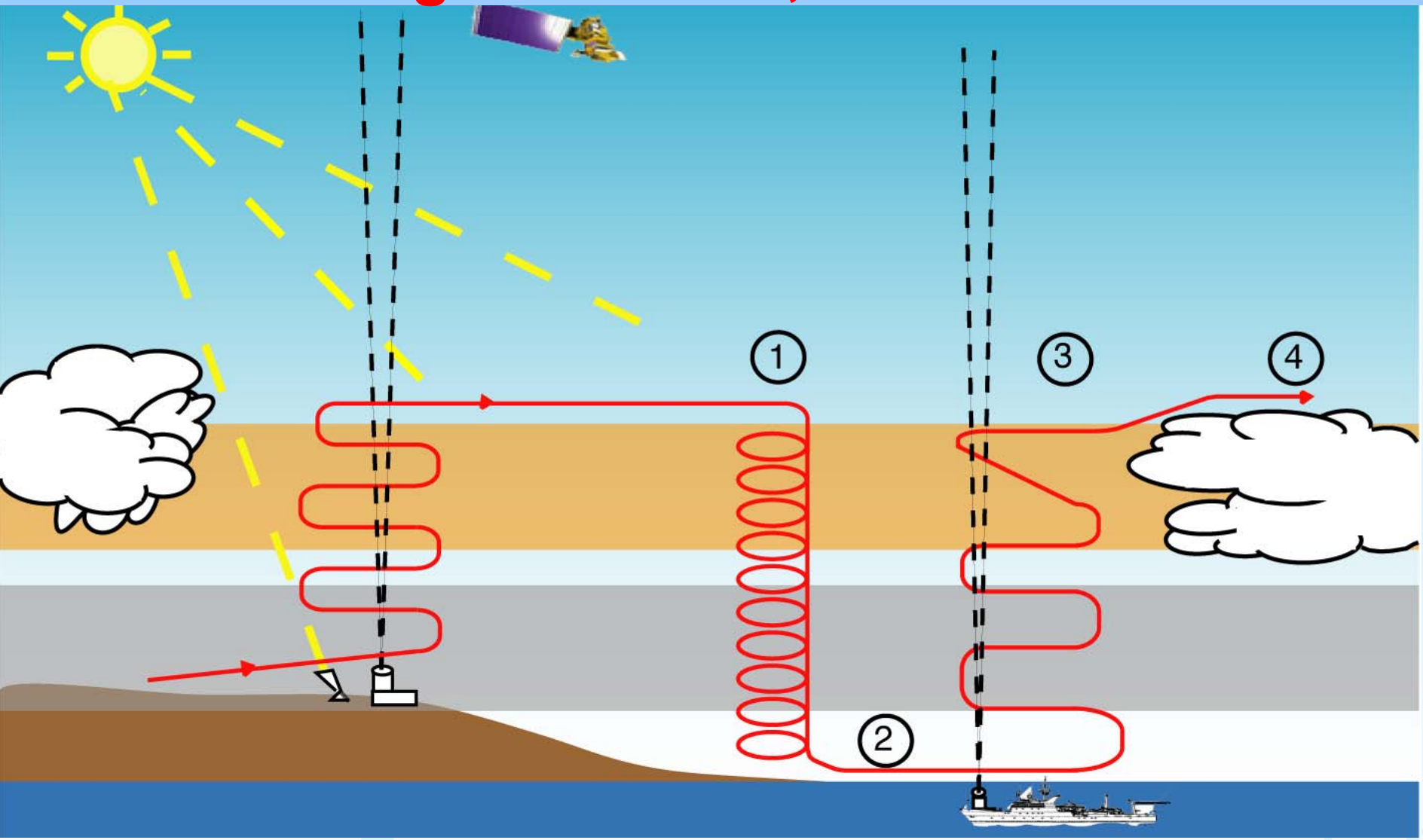
- Assess the radiative impact of the aerosols and clouds in the air advecting from North America out over the Northwestern Atlantic Ocean.

- Quantify the relationships between aerosol and cloud properties and the above radiative impacts.

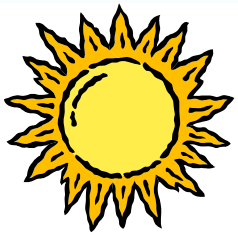
R/V Ron Brown Operations Area



Planned Flight Patterns, J31 in INTEX-ITCT



(1) Survey Vertical Profile. (2) Minimum- Altitude Transect.
(3) Parking Garage. (4) Above-Cloud Transect.



Satellites

up- and downwelling radiative fluxes

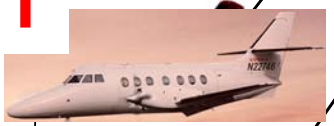
P3

up-and downwelling radiative fluxes

NOAA Lidar

lidar

J31



AOD

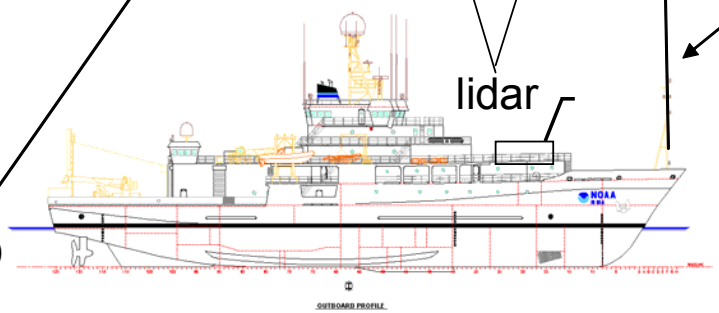
extinction profiles

downwelling radiative fluxes and AOD

DC8

In-situ measurements of aerosol chemical, physical, optical, f(RH) properties.

lidar



AOD

Direct Radiative Effects:
What is the clear-sky radiative impact of the aerosols advecting from North America out over the Northwestern Atlantic Ocean?

Ronald H. Brown & Chebogue Point

J31 Readiness for INTEX-ITCT

- AATS-14, SSFR, POS, P_{stat}, T_{tot}, T_{dp} , Nav/Met Data System integrated in early May
- Combined FRR-AFSR 12 May
  - Action items: Make minimum-crew flight, check for leaks, EMI, etc.
- 2 test flights (including minimum-crew flight), 13 May
- Since then, all above sensors de-integrated for calibrations, tests, & use elsewhere
- Recent activities focused on integrating radar altimeter

Plan

- Complete radar altimeter installation next week (week of 28 June)
- Re-install all sensors weeks of 28 June & 5 July. Add P_{tot}.
- Deploy to Pease 10 July. Test instruments in transit.
- Ops at Pease, 12 July-8 Aug.
  - Minimum altitude over water: 200' straight & level, 300' in turns

Jetstream-31 in INTEX-ITCT

End of Presentation
(Remaining slides are backup)

Jetstream-31 in INTEX-ITCT

Task Order with Sky Research to Include

- J31 mods to accommodate AATS-14 & SSFR
- Instrument integration & test flights
- 4 weeks at Pease International Tradeport, NH
- Tentative dates: 12 July- 8 Aug
- 50 flight hours

Jetstream-31 in INTEX-ITCT

- 14-channel Ames Airborne Tracking Sunphotometer (AATS-14)

Measures: Solar direct-beam transmission, T, at 14 wavelengths, λ, 353-2139 nm

Data products

- Aerosol optical depth (AOD) at 13 λ, 353-2139 nm
- Water vapor column content [using T(940 nm)]
- Aerosol extinction, 340-2139 nm
- Water vapor density

} When A/C flies vertical profiles

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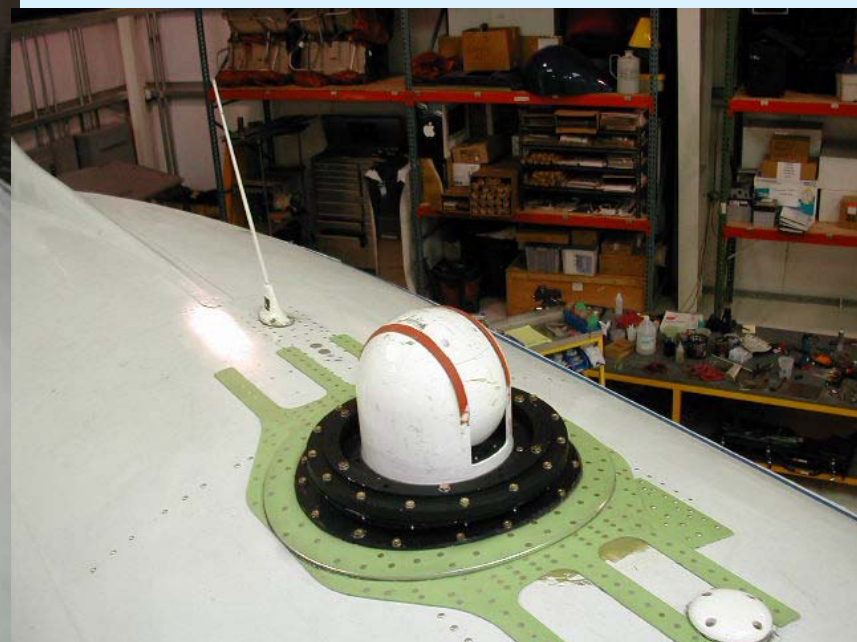
Solar Spectral Flux Radiometer (SSFR).
PI: Peter Pilewskie

Measures:

- Up- and down-welling flux
- 300-1700 nm, Resolution 8-12 nm, 1Hz



Jetstream-31 in INTEX-ITCT

Specs & Performance

Parameter	Specification
Length	47’ 2”
Wingspan	52’
Ceiling	25,000’
Airspeed	
Max cruise 16,000’	220 kt
Survey	150 kt
Range	850 nmi
Endurance	5 hr

AATS-14 Science Plans

- Study the radiative-climatic effects of aerosols in the context of the Summer 2004 experiments on transcontinental/ intercontinental flows
- Address the following INTEX & ITCT needs cited by INTEX White Paper and ITCT Plan:

- Airborne measurements of spectral optical depth (INTEX Table 2, Priority 2: Very important)

- Large-scale continental outflow characterization (Flight Type 4, p. 15) using our column measurements of aerosol OD and H_2O.

- Satellite validation (Flight Type 8, p. 15) using the same

- Integrated analyses that combine satellite and suborbital measurements to assess impacts of continental outflows on the larger-scale atmosphere and climate

- Other INTEX & ITCT goals, including characterizing outflow from US and Canadian fires, vertical profiling over ships and fixed sites from boundary layer to free troposphere, and inter-comparisons to test and validate measurements on multiple aircraft platforms.

Science Plans: Integrated Analyses

- Satellite Validation
- Testing Closure (Consistency) among Suborbital Results
- Testing Chemical-Transport Models
- Deriving Aerosol Absorbing Fraction (1-SSA) from Radiative Flux and AOD Spectra
- Assessing Regional Radiative Forcing by Combining Satellite and Suborbital Results

SSFR measurements to determine absorption by an atmospheric layer

Downwelling Flux: $F\downarrow$

Upwelling Flux: $F\uparrow$

Net Flux: $F\downarrow - F\uparrow$

Flux Divergence (absorption):

$$(F\downarrow - F\uparrow)_{2000m} - (F\downarrow - F\uparrow)_{43m}$$

Fractional absorption:

$$[(F\downarrow - F\uparrow)_{2000m} - (F\downarrow - F\uparrow)_{43m}] / F\downarrow_{2000m}$$