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AIRSAR South American Deployment

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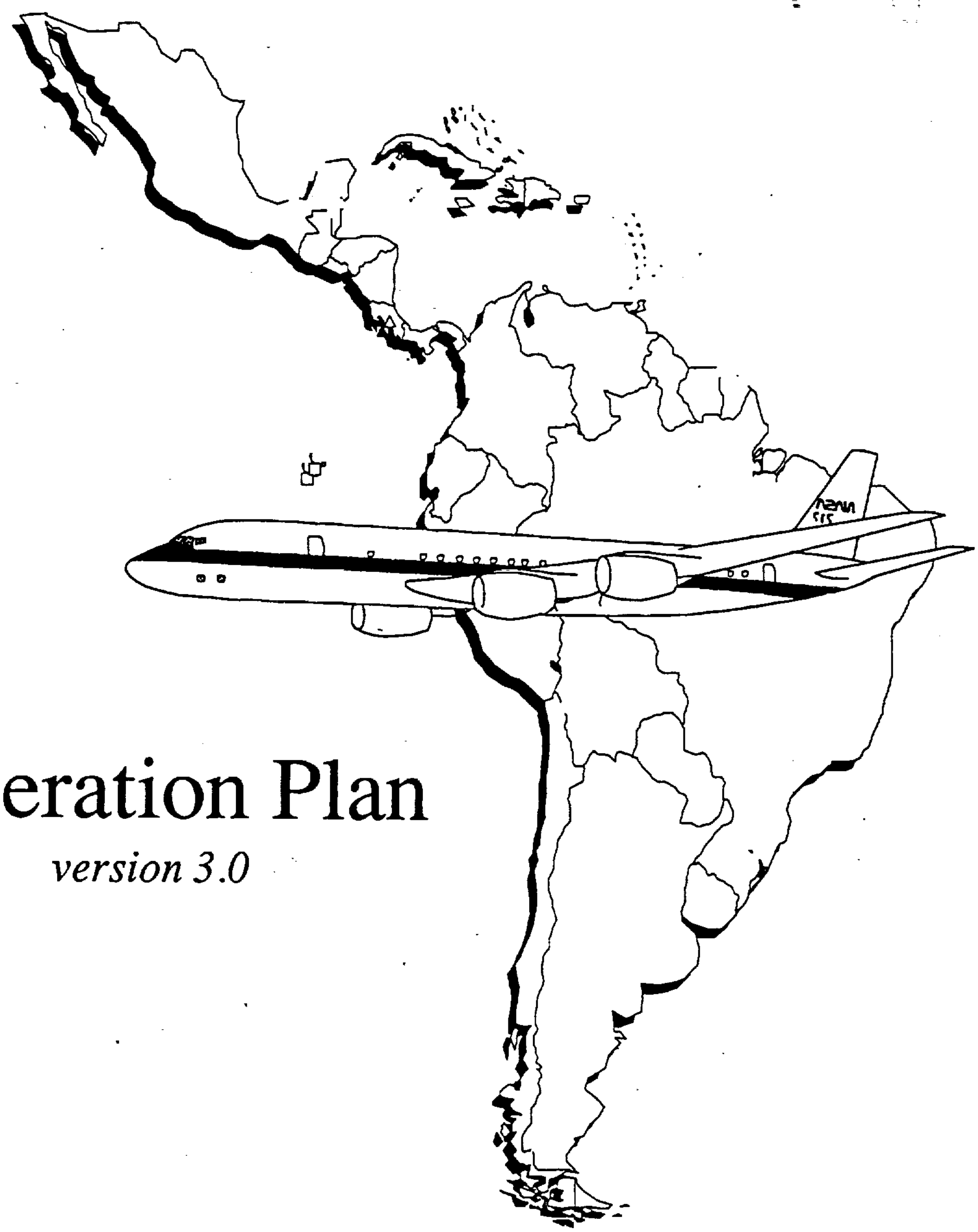


Operation Plan

version 3.0

AIRSAR South American Deployment

The United States National Aeronautics and Space Administration (NASA) and the Brazilian Commission for Space Activities (COBAE) are undertaking a joint experiment involving NASA's DC-8 research aircraft and the Airborne Synthetic Aperture Radar (AIRSAR) system during late May and June 1993. The research areas motivating these activities are: (1) fundamental research in the role of soils, vegetation, and hydrology in the global carbon cycle, and (2) in cooperation with South American scientists, airborne remote sensing research for the upcoming NASA Spaceborne Imaging Radar (SIR)-C/X-SAR flights on the Space Shuttle.

The following pages show a flight schedule and plans for the deployment that were developed at the Ames Research Center and the Jet Propulsion Laboratory (JPL) by using the flight requests received and approved by NASA Headquarters in response to a Dear Colleague letter dated May 29, 1992. The approved Principal Investigators (PIs), investigation titles, and approximate site locations are also listed.

The plan development included an attempt to accommodate all data requirements in the approved requests within the resources available, with the primary limitations being the length of the deployment (37 days) and the total number of DC-8 flight hours available within that time frame. The only major restriction imposed by those limits was the deletion of the sites south of about 24°S latitude. Most of the other approved data requests are accommodated by this plan, subject to some caveats listed below.

Included in the following pages are maps of the site locations and schematic indications of flight routes and dates, plots showing swath locations derived from the flight requests and generated by flight planning software and, most importantly, a calendar showing which sites will be imaged each day. Although the scheduling may not follow any obvious logical pattern, it is the result of incorporating a large number of disparate and sometimes conflicting requirements such as the desire to acquire multitemporal data at sites, coordination with satellite overflights, and so on. It should also be understood that the schedule is not set in concrete and will continue to evolve in response to changing PI experiment plans, changes imposed by the acquisition of international flight clearances, and any anomalies experienced during the deployment itself. Every attempt will be made to coordinate any and all such changes with the PIs involved, and the establishment and maintenance of good lines of communication both during the planning and operations phases will be of utmost importance.

The schedule has been developed based upon the following assumptions:

1. Both the DC-8 and the AIRSAR systems will function normally and any hardware problems will be minimal. A small amount of margin has been built into each day's flight plan, but since the deployment cannot be extended beyond the planned number of days, any major hardware anomalies will necessarily result in the loss of data. Although historically the reliability of both systems has been exceptionally high, and in fact the AIRSAR has not failed to acquire planned data due to hardware or system problems in its five years of operation, it must be remembered that the deployment is done on a best-effort basis and aircraft or radar problems could result in schedule changes or, in the worst case, the deletion of some sites.

2. Clearance will be obtained through the NASA International Affairs Office to overfly and acquire radar imaging data from each of the countries involved. At this writing, this has not yet been completed and historically it has been difficult to obtain flight clearance for some countries.

3. There will be no significant problems with Air Traffic Control (ATC) or with flying into military or other restricted flight zones. The DC-8 flies at the same altitudes as commercial air traffic and each day's flight plan must be cleared and approved by the proper ATC authorities. In the past, this has occasionally resulted in changes to flight plans or take-off times to minimize interference with other air traffic, particularly in foreign countries. Work so far indicates that no sites violate any military or restricted flight zones, but a final determination will have to wait for the development of more detailed flight plans by the DC-8 navigators.

4. Unless otherwise requested by the PI, all AIRSAR data will be acquired in the standard three-frequency quad-polarization mode. Where TOPSAR mode data have been requested, C-band polarimetric data will not be acquired but, instead, a CVV image will be produced along with a digital topographic map registered to the C-band image and L- and P-band polarimetric data sets. Note that although JPL has developed operational TOPSAR processor software, hardware for the systematic processing of TOPSAR data is not yet available. Thus processing of all TOPSAR mode data will be done by arrangement as special products outside the normal AIRSAR processing system.

In addition to AIRSAR, two other interesting and important experiments will also be installed on the DC-8 and will acquire data during this deployment: the lightning detection and lidar experiments, which will utilize upward-looking optical sensors and will prefer to have data acquired during dark conditions, i.e., during early evening or night and with no moon. Since AIRSAR flights generally have morning takeoffs so that during the daylight the video and film cameras may operate and the PIs collecting surface truth data at ground sites may work, some adjustments will be made.

The plan for the deployment will be to have afternoon takeoffs whenever weather forecasts indicate that a thunderstorm imaging opportunity will occur. This will allow the acquisition of: SAR data during daylight, and lightning and lidar data during the latter part of the flight in the early evening. These opportunities are most likely to occur during mid June 1993, and in the central and western portions of Brazil, Bolivia, and Peru. Unfortunately this means that exact take-off times cannot yet be determined for each flight, but every attempt will be made to coordinate take-off and overflight times with the PIs in the field during the deployment itself.

PI Affiliation	Title	Site	approx Lon,	Lat
John R. Baker British National Space Centre	AIRSAR Estimation of Tropical Forest Biomass for Carbon Cycle Studies	Manaus-Reserva Du. Sena Maduriera Rio Tapajos	-59.57 -68.67 -55.00	-2.57 -9.25 -3.50
Paolo Canuti Univ. of Florence	Contribution of SAR for Estimating Soil Erosion	Bermejo Basin Homahuaca	-63.00 -65.50	-23.50 -23.75
Luciano Dutra INPE	Rain Forest Type Discrimination, Flood Plain Mapping, Calibration Studies, and SAR Model Assessment Using AIRSAR Data: Tapajos Region	Rio Tapajos Cachoeira Porteira	-54.80 -57.05	-3.05 -0.65
Tony Freeman Jet Propulsion Lab	JERS-1 Calibration Underflight (Amazon)	Manaus Rio Tapajos	-60.10 -55.20	-3.20 -3.70
Ron Greeley Arizona State Univ.	The Relationship Between Radar Backscatter and Aerodynamic Roughness	Cerro Quisharo, Alti	-68.75	-18.75
Dirk H. Hoekman Wageningen Agricultural Univ.	Remote Sensing of Tropical Rain Forests	Araracuara, Columbia Mabura Hill, N, Guyana Mabura Hill, S, Guyana San Jose del Guaviare	-72.07 -57.90 -58.64 -72.61	0.65 6.70 5.08 2.47
Bryan Isacks Cornell University	SIR-C Analysis of Topography and Climate in the Central Andes	Cordillera Blanca, Peru Cordillera Real, Bolivia Quelccaya Ice Cap Potosi	-77.53 -68.29 -70.42 -65.63	-9.25 -16.19 -13.96 -19.69
Hermann Kux INPE	Forestry and Land Use in Western Amazonia, Acre State Brazil	Sena Maduriera	-68.45	-9.00
John Kwiatkowski Michigan Technological Univ.	Applications of Polarimetric Radar in Coherent Imaging of Earth and Remote Sensing of Precipitation	Ocean sites en route		
Thuy Le Toan Centre d'Etude Spatiale des Rayonnements	Study of Tropical Rain Forest by SAR Data in French Guiana	Kaw St Elie Paracou St Laurent	-52.10 -53.03 -53.97	4.72 5.28 5.48
John M. Melack Univ. of California, Santa Barbara	Determining the Extent of Inundation on Subtropical Floodplains Beneath Vegetation of Varying Types	Anavilhanas Cabaliana Pantanal	-60.78 -60.90 -57.42	-2.64 -3.40 -19.67
Peter J. Mouginis-Mark Univ. of Hawaii	Radar-Derived Topography of Volcanoes in the Western Galapagos Islands	Galapagos	-91.00	-1.00

PI Affiliation	Title	Site	approx Lon, Lat	
Waldir Paradella INPE	Geobotanical Investigation and Lithological Discrimination by AIRSAR Data in the NE of Brazil	Curaca Valley	-39.83	-9.21
Jack Paris Calstate Fresno	Global Biodiversity: Assessment of Habitat Change and Species Extinctions with Multinanometer SAR	Manaus area	-59.75	-2.50
Kevin O. Pope GeoEcoArc Research	SIR-C Tropical Wetlands Project	Merida Rio Bravo Rio Hondo	-90.25 -89.03 -88.55	20.75 17.52 18.27
Jeffrey E. Richey Univ. of Washington	Land Use, Forest Type and Biomass Assessment Using Polarimetric SAR	Manaus-Fazenda Di. Manaus-Reserva Du.	-59.97 -60.10	-2.43 -2.93
Davis D. Sentman University of Alaska Fairbanks	Optical Imaging of Cloud-to-Ionosphere Electrical Discharges in Brazil	Thundercloud sites		
David Sheres Stennis Space Center	SAR Measurements of Rain, Waves, Fronts and Eddies	Gulf of Mexico	-89.00	27.00
David Skole University of New Hampshire	Assessing Secondary Growth and Carbon Accumulation in Disturbed Tropical Forests Using Airborne Synthetic Aperture Radar	Nova Vida Paradise	-62.79 -63.31	-10.19 -9.58
Joao Vianei Soares INPE	Surface Hydrology of Semiarid Floodplains (Varzeas) in Northeast Brazil (SIR-C/X-SAR)	Bebedouro	-40.28	-9.08
Vincente Paulo Soares Federal Univ. of Vicosa	Relationship between Radar Image Backscatter and Eucalyptus Stand Characteristics	Minas Gerais	-42.63	-19,80
John W. Terborgh Duke University	Vegetation Mapping of a Headwater Catchment in the Amazon Basin: Manu National Park, Peru	Manu National Park	-12.05	-70.35
Jakob J. vanZyl Jet Propulsion Lab	Use of SAR Imagery in Monitoring the Hydrology of Semi-Arid Floodplain Areas in Brazil	Bebedouro	-40.28	-9.08
Howard A. Zebker Jet Propulsion Lab	Topsar Topographic Mapping Research and Support for the South American DC-8 Deployment	Manaus area Galapagos Islands	-59.75 -91.00	-2.50 -1.00

The Schedule

The following calendars for May and June 1993 show each flight day for the DC-8, indicated by an aircraft icon. The notation *Data Flight* indicates flights where the DC-8 takes off from and returns to the same base, and *Transit to...* indicates takeoff from one base and landing at another, generally with data being acquired en route.

May 25: The DC-8 will depart from its home base at Moffett Field, California and will acquire oceanographic data over the Gulf of Mexico before landing at Houston International Airport.

May 27: After one day in Houston the aircraft will transit to San Jose, Costa Rica with data acquired en route over the Gulf of Mexico and ecology sites near Merida, Mexico and Rio Hondo and Rio Bravo, Belize.

May 29: After one day in San Jose the next flight will be a transit to Guayaquil, Ecuador via the Galapagos Islands. The objective will be to map all of Isla Fernandina and Isla Isabela in TOPSAR mode, as indicated on the attached map, but as currently planned this flight is near the duration limit for a one day DC-8 flight and a slightly smaller data set may be acquired.

May 31: During this flight from Guayaquil the sites at Aracuara and San Jose del Guaviare in Colombia will be imaged, as well as the set of lines called the"volcano transect." Not yet planned in detail, these lines will image a number of Andean volcanoes along a track intended to cover as many individual sites as possible.

June 2: During the transit to Santa Cruz, Bolivia TOPSAR mode data will be acquired at Cordillera Blanca and the Quelccaya Ice Cap in the Peruvian Andes, and the site at Manu National Park will also be imaged.

June 4: Data sites for this flight from Santa Cruz include Cordillera Real and Potosi, which will be imaged in TOPSAR mode, and Cerro Quisharo near the Chilean border.

June 6: Flying south into Argentina, AIRSAR will collect data at the hydrology sites at Bermejo Basin and Homahuaca, then the rest of the flight will be dedicated to Dave Sentman's lightning imaging experiment. Since the lightning experiment is weather dependent, the scheduling for this flight may be modified in real time to match the opportunities that arise.

June 8: This transit flight to Recife, Brazil will cover the Pantanal site in Brazil and the SIR-C/X-SAR "super site" at Bebedouro.

June 11: This flight will be second of four to overfly Bebedouro, the intent being to acquire data under different ground conditions, primarily soil moisture. For that reason the date of this and the following flight may be adjusted slightly according to weather conditions. Also covered on this day will be the site at Minas Gerais.

June 12: During this flight data will be acquired at the Curaca Valley site as well as Bebedouro.

June 15: This transit flight into Manaus provides one last opportunity to image Bebedouro, and in transit the site at Rio Tapajos will be covered in both SAR and TOPSAR modes.

June 17: This will be the first of two flights over the Manaus area, with the plan being to acquire data along tracks matching the ground swaths of both the JERS-1 and Shuttle Imaging Radar experiments. The dates of this and the following flight may be adjusted to accommodate the lightning imaging experiment.

June 19: This flight will be divided between the acquisition of data along certain specific tracks in the Manaus area for Howard Zebker's forest investigation, and at targets of opportunity for the lightning imaging experiment. Due to the weather-dependent nature of the lightning experiment, the flight may occur on a different day or be swapped with the preceding flight.

June 21: During this flight data will be acquired at the SIR-C/X-SAR site at Sena Madureira as well as at Paradise and Nova Vida. Finally, data lines will be flown at the Rio Tapajos site to match an overflight of the JERS-1 satellite which will be imaging the region on that day.

June 24: The transit to San Juan, Puerto Rico will provide coverage at the Cachoreira Porteira site northeast of Manaus, Kaw, Paracou and St. Laurent along the coast of French Guiana, and Mabura Hill in Guyana.

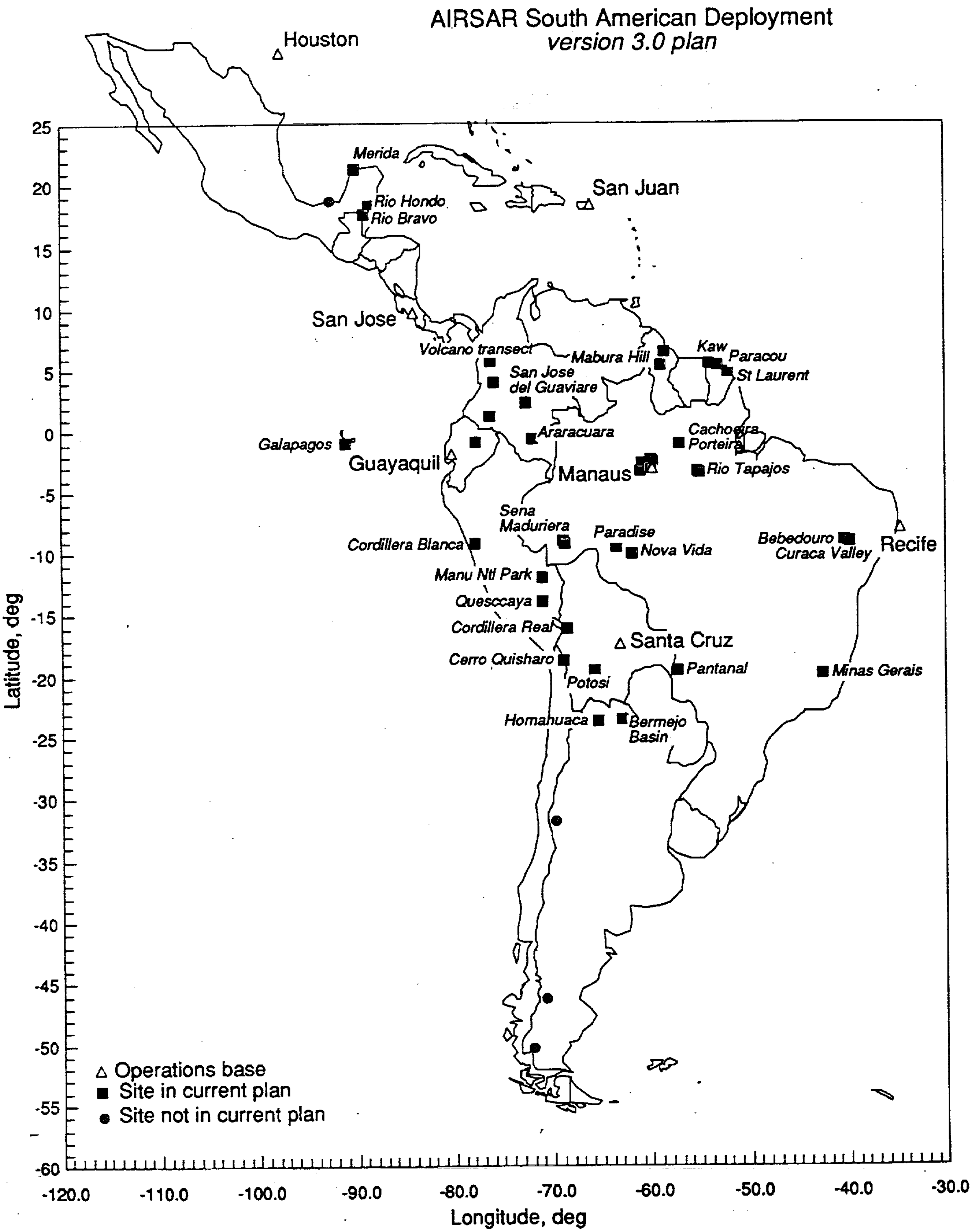
June 26: This last flight of the deployment will be a transit back to Moffett and no AIRSAR data will be acquired.

May 1993

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	4	5	**Engineering flight** 6	7	8
9	**Engineering flight** 10	11	12	13	14	15
16	17	**Calibration flight** Rosamond Fort Irwin Crystal Spring 18	**Data flight** Jornada Sevilleta 19	20	21	22
23	24	**Transit to Houston** Gulf of Mexico 25	26	**Transit to San Jose** Gulf of Mexico Merida Rio Hondo Rio Bravo 27	28	**Transit to Guayaquil** Galapagos 29
30	**Data Flight** Colombian volcanics San Jose del Guaviare Araracuara 31					

June 1993

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
		1	**Transit to Santa Cruz** Cordillera Blanca Manu National Park Quelccaya Ice Cap 2	3	**Data Flight** Cordillera Real Cerro Quisharo Potosi 4	5
Data Flight Bermejo Basin Homahuaca thunderstorm oppty 6	7	**Transit to Recife** Pantanal Bebedouro 8	9	10	**Data Flight** Minas Gerais Bebedouro 11	**Data Flight** Curaca Valley Bebedouro 12
13	14	**Transit to Manaus** Bebedouro Rio Tapajos 15	16	**Data Flight** Manaus sites 17	18	**Data flight** Manaus sites thunderstorm oppty 19
20	**Data flight** Sena Madureira Paradise Nova Vida Rio Tapajos (JERS) 21	22	23	**Transit to San Juan** Cachoeira Porteira Kaw Paracou St. Laurent Mabura Hill 24	25	**Transit to Moffett** 26
27	28	29	30			


AIRSAR South American Deployment
version 3.0 plan
Houston
Merida
Rio Hondo
Rio Bravo
San Juan
San Jose
Volcano transect
Mabura Hill
Kaw
Paracou
St Laurent
San Jose
del Guaviare
Cachoeira
Porteira
Araracuara
Galapagos
Guayaquil
Manaus
Rio Tapajos
Sena
Maduriera
Paradise
Nova Vida
Cordillera Blanca
Bebedouro
Curaca Valley
Recife
Manu Ntl Park
Quesccaya
Cordillera Real
Santa Cruz
Cerro Quisharo
Potosi
Pantanal
Minas Gerais
Homahuaca
Bermejo
Basin
Operations base
Site in current plan
Site not in current plan
Latitude, deg
Longitude, deg
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-120.0
-110.0
-100.0
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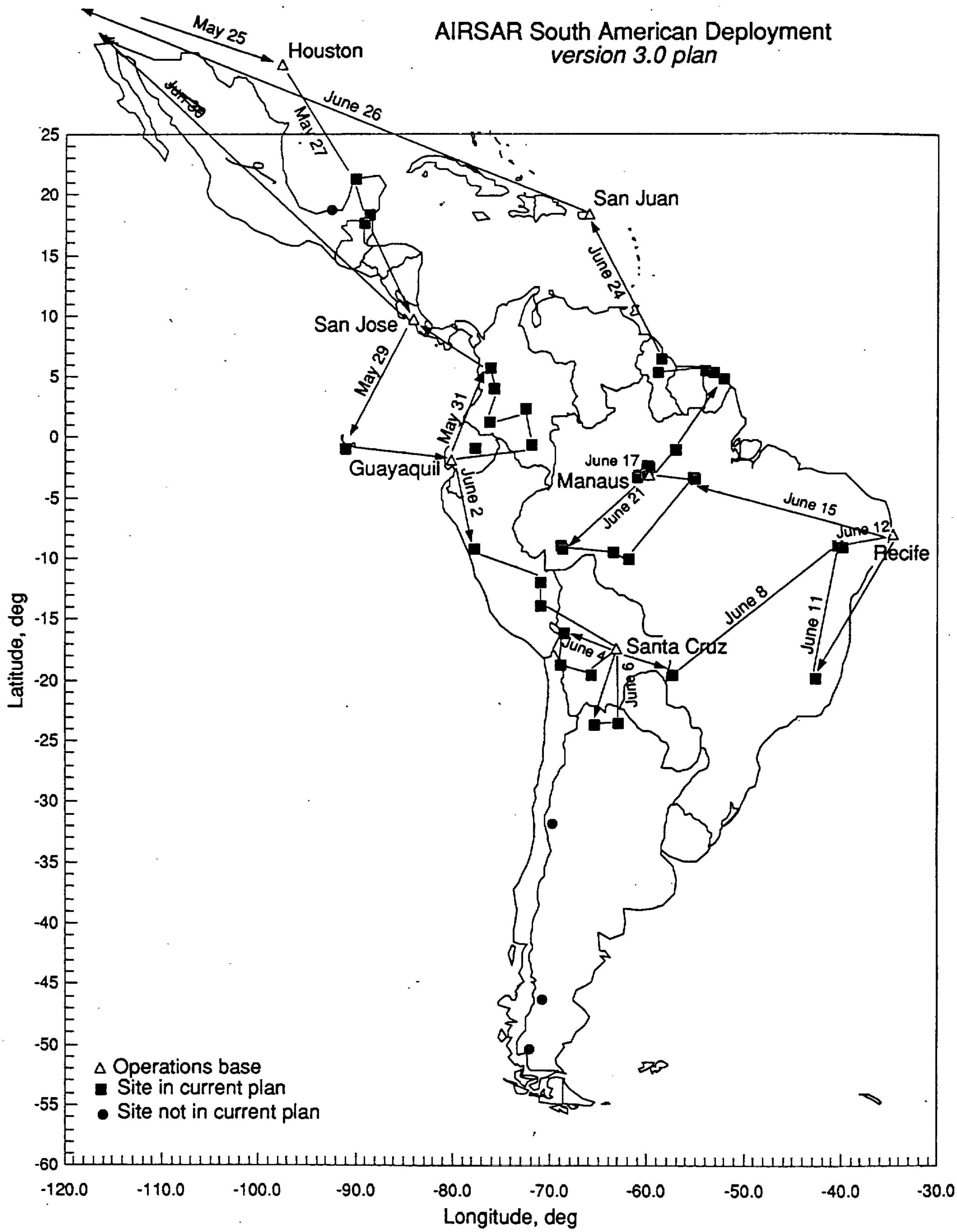
-40.0
-30.0



AIRSAR South American Deployment
version 3.0 plan
Houston
May 25
June 26
May 27
Jun 30
San Juan
June 24
San Jose
May 29
May 31
Guayaquil
June 2
June 17
Manaus
June 21
June 15
June 12
Recife
June 8
June 11
Santa Cruz
June 4
June 6
△ Operations base
■ Site in current plan
● Site not in current plan
Latitude, deg
Longitude, deg
25
20
15
10
5
0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
-55
-60
-120.0
-110.0
-100.0
-90.0
-80.0
-70.0
-60.0
-50.0
-40.0
-30.0

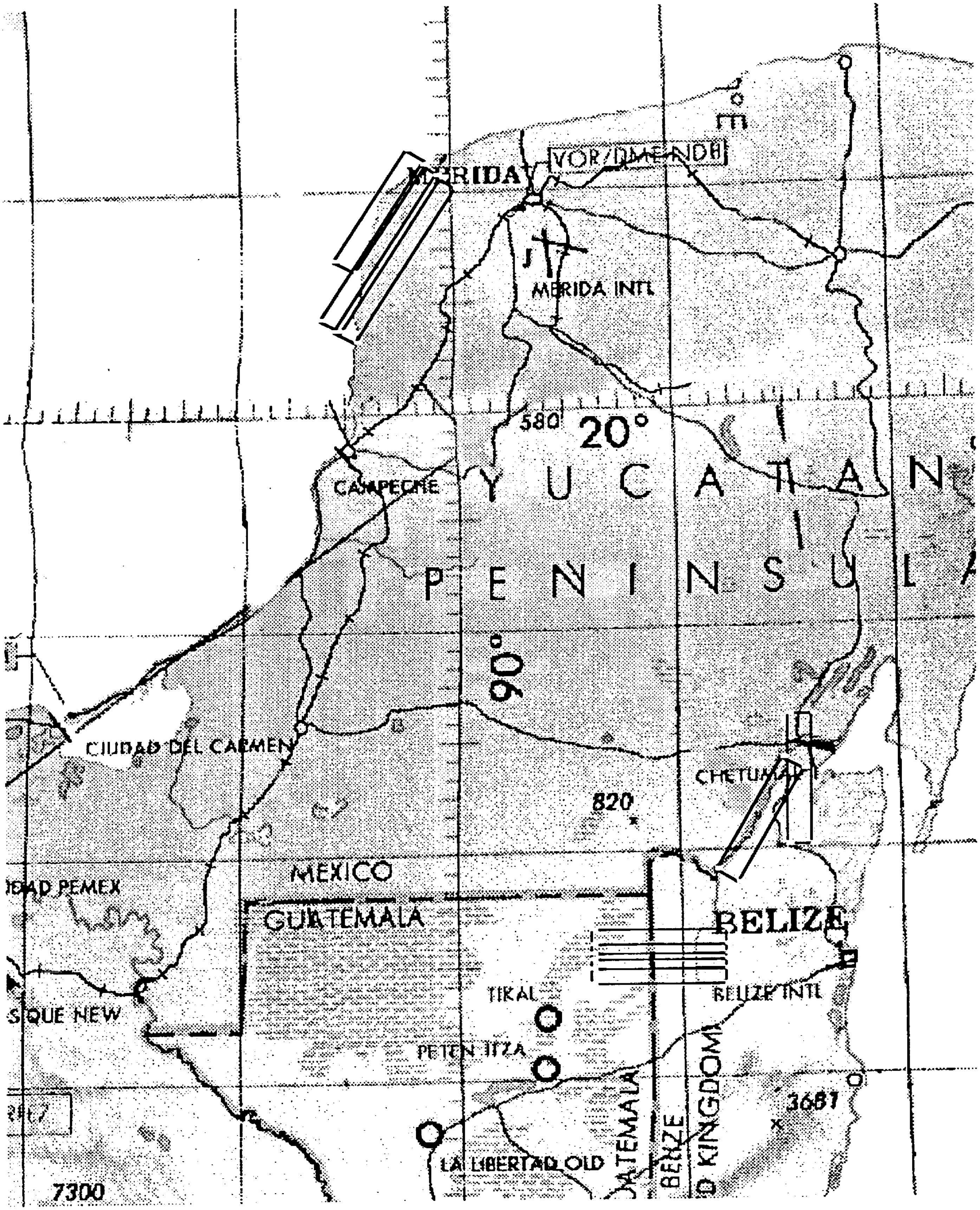
South America '93

version 3.0

Date	450 kt Latitude d	m	0.02 Longitude d	m		Transit to	Data	Total
25-May	37	24.9	-122	2.8	Moffett			
	27	55.0	-93	35.0	Gulf of Mexico	3.4	2.0	
	29	27.0	-95	12.6	Houston	0.3		
					Block time	0.8		6.45
27-May	29	27.0	-95	12.6	Houston			
	27	55.0	-93	35.0	Gulf of Mexico	0.3	1.0	
	20	45.0	-90	15.0	Merida	1.0	0.8	
	18	16.2	-88	33.0	Rio Hondo	0.4	0.5	
	17	31.2	-89	1.8	Rio Bravo	0.1	0.5	
	9	33.6	-84	3.0	San Jose	1.2		
					Block time	0.8		6.57
29-May	9	33.6	-84	3.0	San Jose			
	-1	0.0	-91	0.0	Galapagos	1.7	4.0	
	-2	6.0	-79	30.0	Guayaquil	1.5		
					Block time	0.8		7.97
31-May	-2	6.0	-79	30.0	Guayaquil			
	0	58.8	-77	54.9	Mayasquer volcano	0.5	0.3	
	1	1.8	-77	48.3	Cumbal volcano	0.0	0.3	
	1	9.0	-77	30.9	Azurfal volcano	0.0	0.3	
	1	22.2	-77	6.9	Galeras volcano	0.1	0.3	
	1	56.7	-76	39.3	Dona Juana vol.	0.1	0.3	
	2	41.1	-76	10.8	Huila volcano	0.1	0.3	
	3	49.5	-75	40.5	Tolima volcano	0.2	0.3	
	4	45.9	-75	22.2	Ruiz volcano	0.1	0.3	
	5	6.9	-75	34.6	Herveo volcano	0.1	0.3	
	2	28.2	-72	36.6	San Jose del Gu.	0.5	0.5	
	0	39.0	-72	4.2	Araracuara	0.3	0.5	
	-2	6.0	-79	30.0	Guyaquil	1.1		
					Block time	0.8		6.99
2-Jun	-2	6.0	-79	30.0	Guayaquil			
	-9	15.0	-77	32.0	Cordillera Blanca	1.0	1.3	
	-12	2.0	-71	12.0	Manu Ntl Park	0.9	1.2	
	-13	57.5	-70	47.5	Quelccaya Ice Cap	0.3	1.2	
	-17	28.8	-63	6.0	Santa Cruz	1.1		
					Block time	0.8		7.59
4-Jun	-17	28.8	-63	6.0	Santa Cruz			
	-16	11.5	-68	16.5	Cordillera Real	0.7	1.5	
	-18	45.0	-68	45.0	Cerro Quisharo	0.3	1.0	
	-19	41.5	-65	38.0	Potosi	0.4	0.5	
	-17	28.8	-63	6.0	Santa Cruz	0.4		
					Block time	0.8		5.63
6-Jun	-17	28.8	-63	6.0	Santa Cruz			
	-23	30.0	-63	0.0	Bermejo Basin	0.8	0.5	
	-23	45.0	-65	30.0	Homahuaca	0.3	0.5	
	-17	28.8	-63	6.0	Thunderstorms/Li.	0.9	4.0	
	-17	28.8	-63	6.0	Santa Cruz	0.0		
					Block time	0.8		7.75
8-Jun	-17	28.8	-63	6.0	Santa Cruz			
	-19	40.2	-57	15.0	Pantanal	0.8	0.0	
	-19	40.2	-57	15.0	Pantanal	0.0	2.0	
	-9	4.8	-40	16.8	Bebedouro	2.6	1.0	
	-8	1.8	-34	32.0	Recife	0.8		
					Block time	0.8		7.92

11-Jun	-8	1.8	-34	32.0	Recife			
	-9	4.8	-40	16.8	Bebedouro	0.8	1.0	
	-19	48.0	-42	37.8	Minas Gerais	1.5	1.3	
	-8	1.8	-34	32.0	Recife	1.9		
					Block time	0.8		7.12
12-Jun	-8	1.8	-34	32.0	Recife			
	-9	4.8	-40	16.8	Bebedouro	0.8	1.0	
	-9	4.8	-40	16.8	Curaca Valley	0.0	1.0	
	-8	1.8	-34	32.0	Recife	0.8		
					Block time	0.8		4.29
15-Jun	-8	1.8	-34	32.0	Recife			
	-9	4.8	-40	16.8	Bebedouro	0.8	1.0	
	-3	48.0	-60	0.6	Tapajos	2.7	4.0	
	-3	48.0	-60	0.6	Manaus	0.0		
					Block time	0.8		7.46
17-Jun	-3	48.0	-60	0.6	Manaus			
	-3	48.0	-60	0.6	dummy	0.0		
	-2	56.0	-60	6.0	Manaus sites	0.1	6.5	
	-3	48.0	-60	0.6	Manaus	0.1		
					Block time	0.8		7.48
19-Jun	-3	48.0	-60	0.6	Manaus			
	-2	56.0	-60	6.0	Manaus sites	0.1	4.0	
	-2	56.0	-60	6.0	Thunderstorms	0.0	3.0	
	-3	48.0	-60	0.6	Manaus	0.1		
					Block time	0.8		7.98
21-Jun	-3	48.0	-60	0.6	Manaus			
	-9	0.0	-68	45.0	Sena Maduriera	1.3	1.5	
	-9	34.8	-63	26.4	Paradise	0.7	0.8	
	-10	11.4	-62	47.4	Nova Vida	0.1	0.8	
	-3	48.0	-60	0.6	Manaus	0.9		
					Block time	0.8		6.85
24-Jun	-3	48.0	-60	0.6	Manaus			
	0	-57.0	-57	3.0	Cachoeira Porteira	0.5	0.5	
	4	43.0	-52	7.0	Kaw	1.0	0.5	
	5	17.0	-53	2.0	Paracou	0.1	0.5	
	5	29.0	-53	58.0	St Laurent	0.1	0.5	
	5	50.0	-58	38.5	Mabura Hill S	0.6	0.5	
	6	41.8	-57	53.9	Mabura Hill N	0.2	0.5	
	18	16.8	-66	4.2	San Juan	1.9		
					Block time	0.8		5.67
26-Jun	18	16.8	-66	4.2	San Juan			
	37	24.9	-122	2.8	Moffett	7.0		
					Block time	0.8		7.71

Totals 111.42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VOR/DME NDB
MERIDA INTL
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PENINSULA
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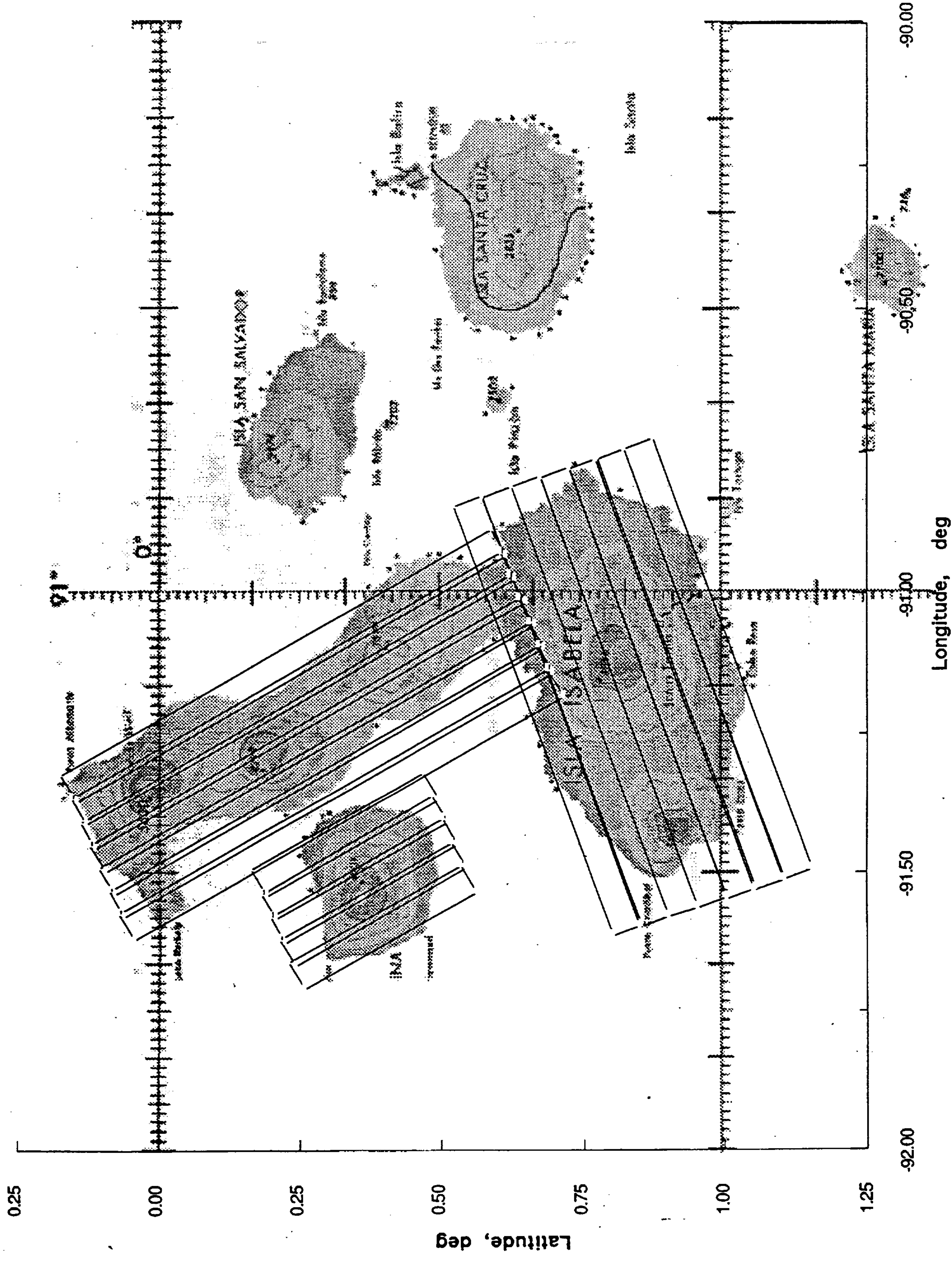
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Latitude, deg
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0.50
0.75
1.00
1.25
91°
0°
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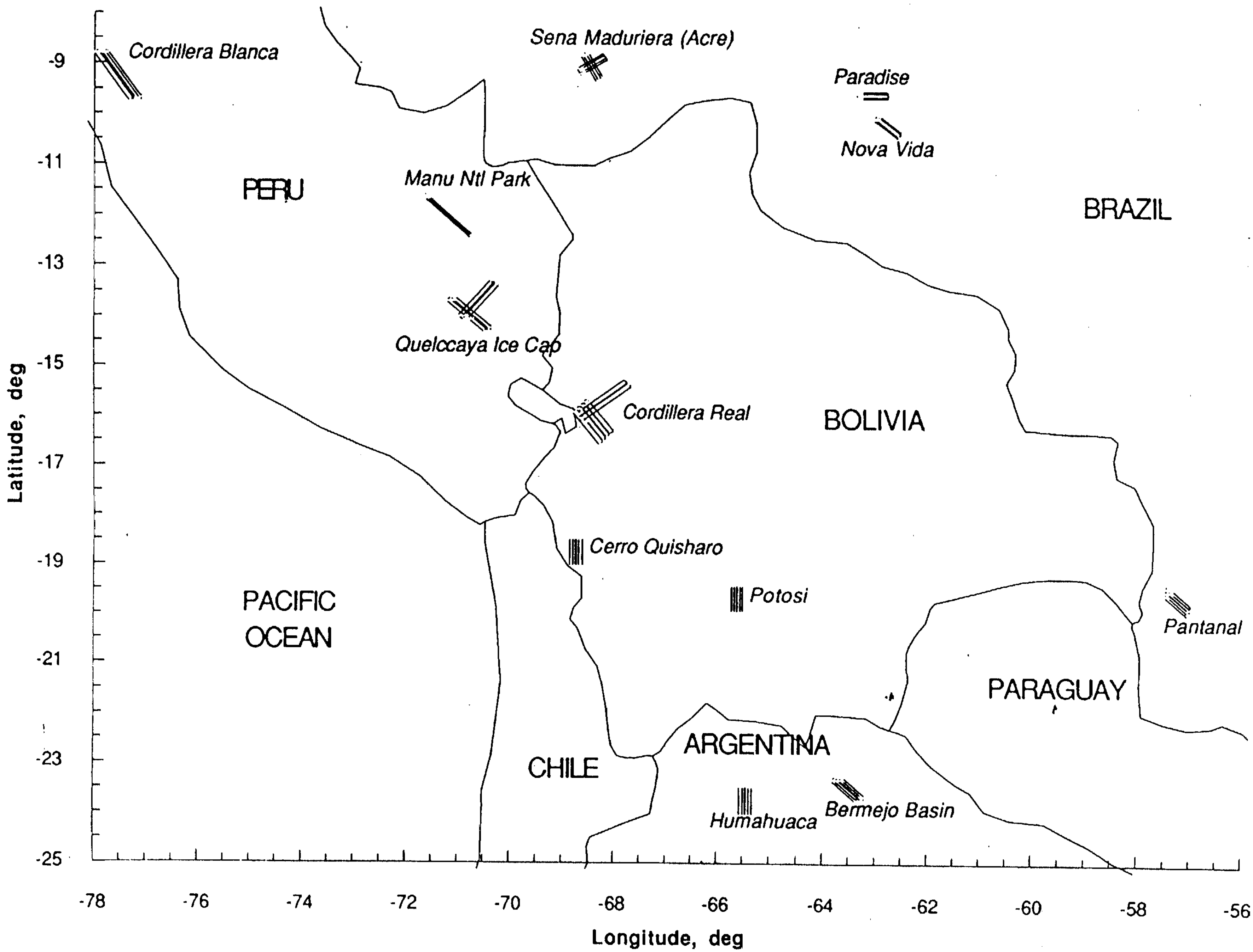
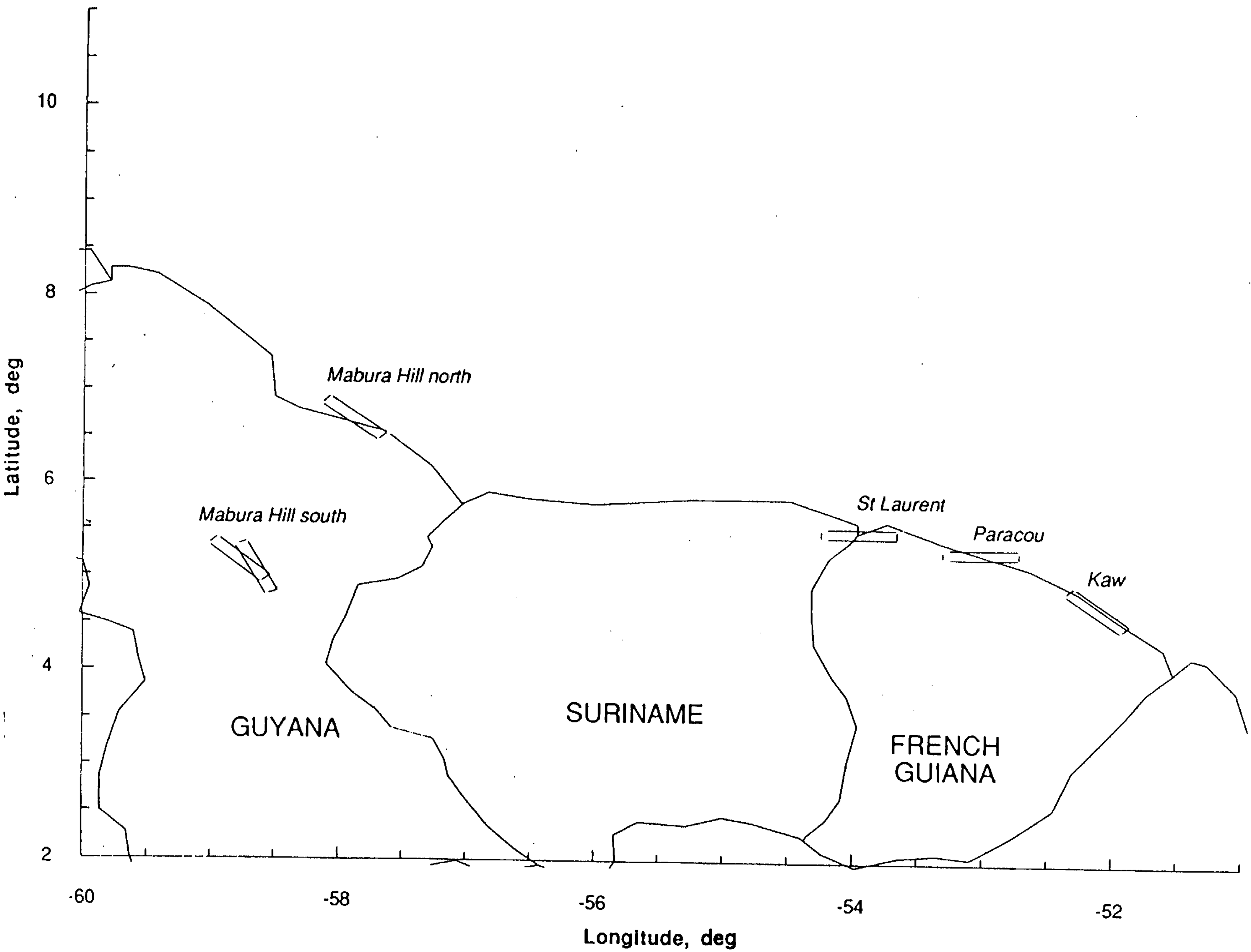
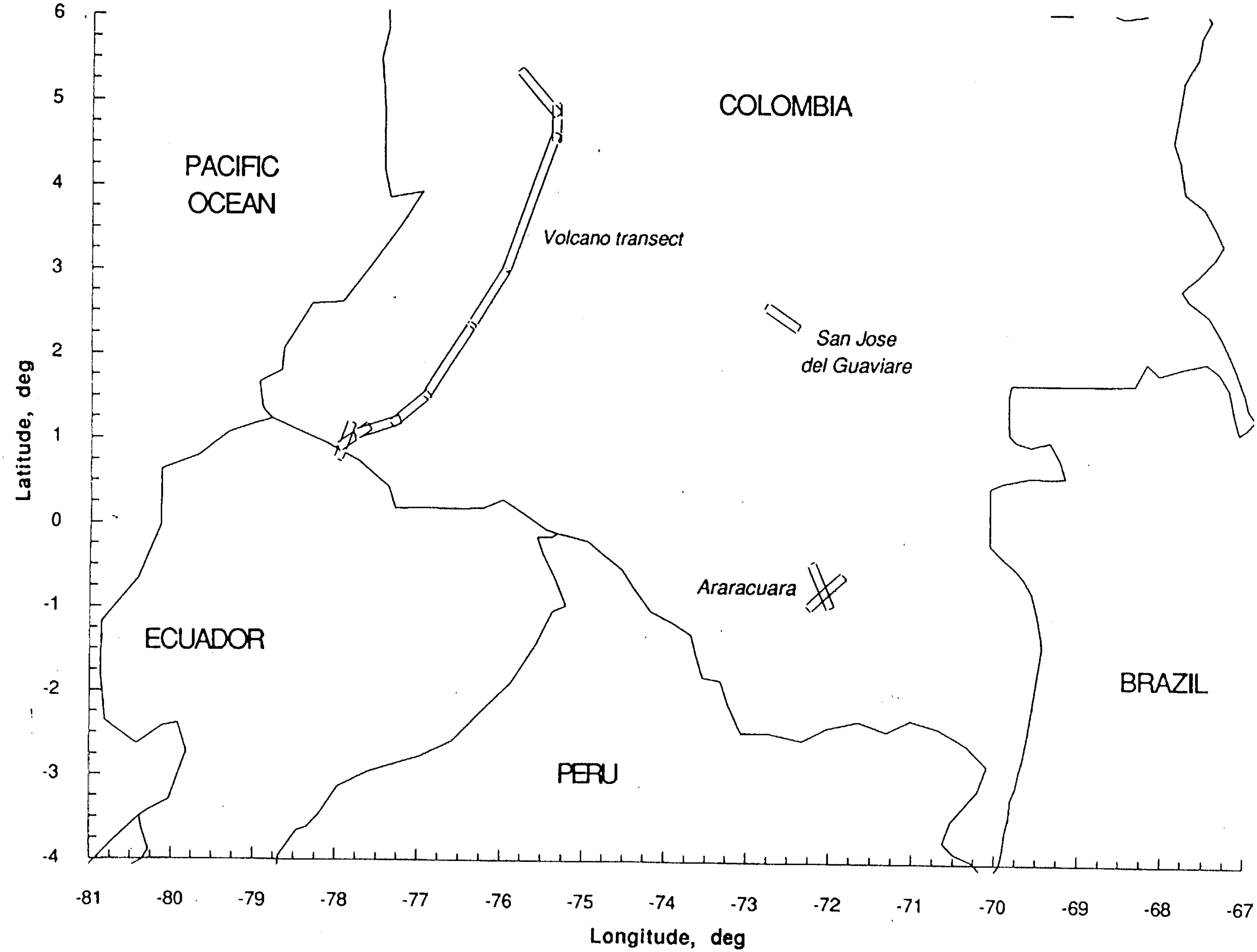
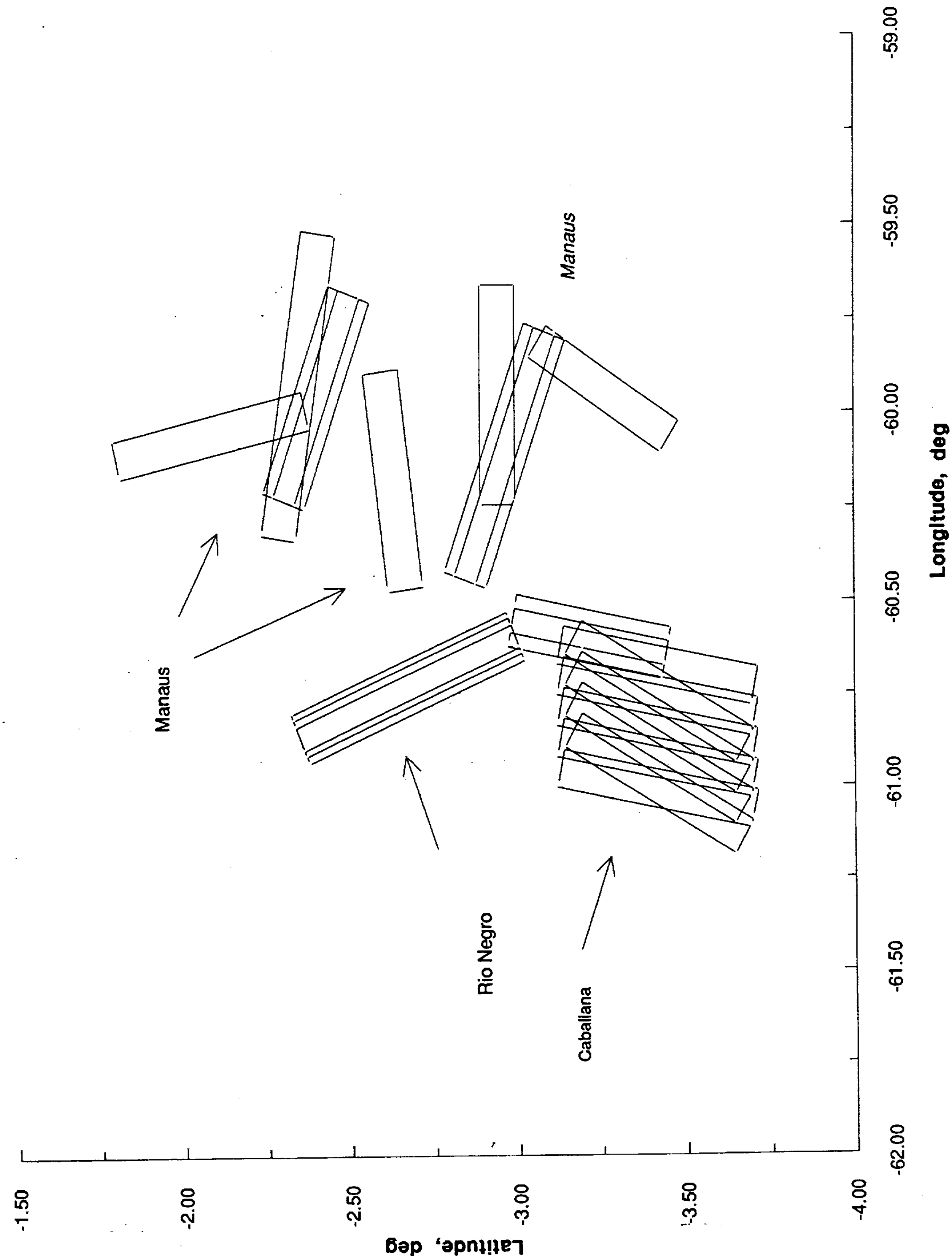
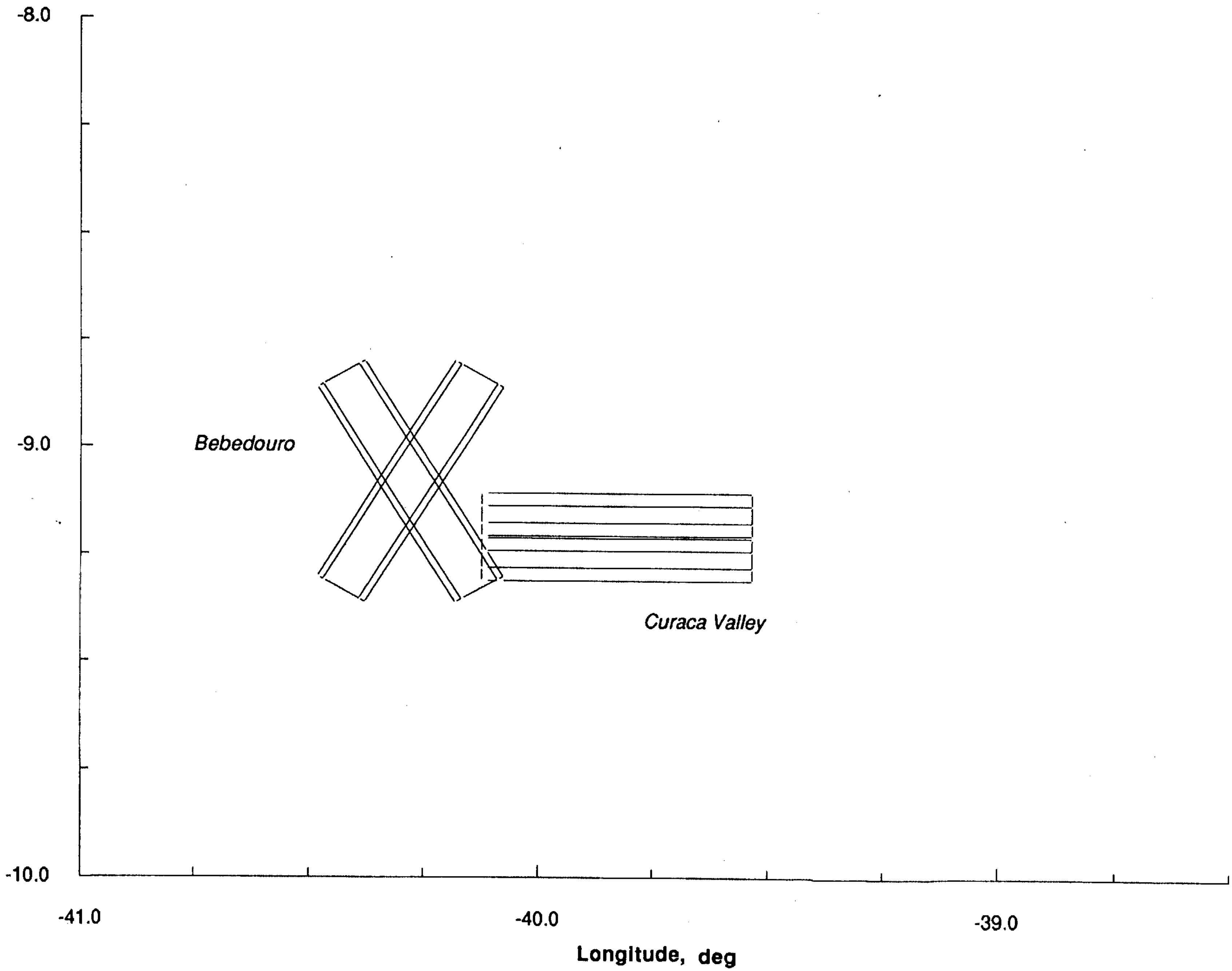
ISLA SAN SALVADOR
ISLA SANTA CRUZ
ISLA SANTA MARIA


Cordillera Blanca
Sena Maduriera (Acre)
Paradise
Nova Vida
PERU
Manu Ntl Park
BRAZIL
Quelccaya Ice Cap
Cordillera Real
BOLIVIA
Cerro Quisharo
Potosi
PACIFIC
OCEAN
Pantanal
PARAGUAY
ARGENTINA
CHILE
Humahuaca
Bermejo Basin
-9
-11
-13
-15
-17
-19
-21
-23
-25
Latitude, deg
-78
-76
-74
-72
-70
-68
-66
-64
-62
-60
-58
-56
Longitude, deg

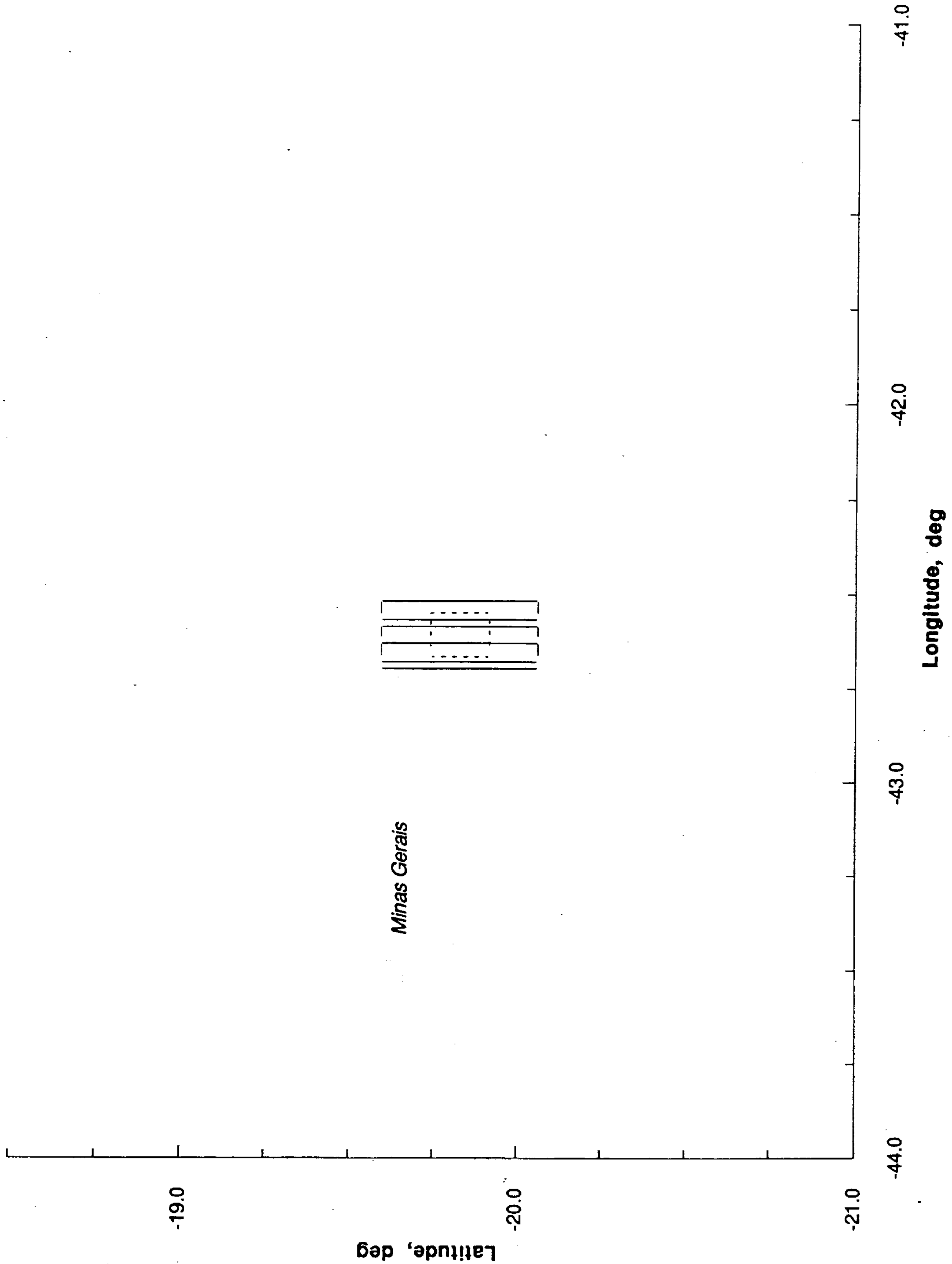

Mabura Hill north
Mabura Hill south
St Laurent
Paracou
Kaw
GUYANA
SURINAME
FRENCH
GUIANA
10
8
6
4
2
Latitude, deg
-60
-58
-56
-54
-52
Longitude, deg

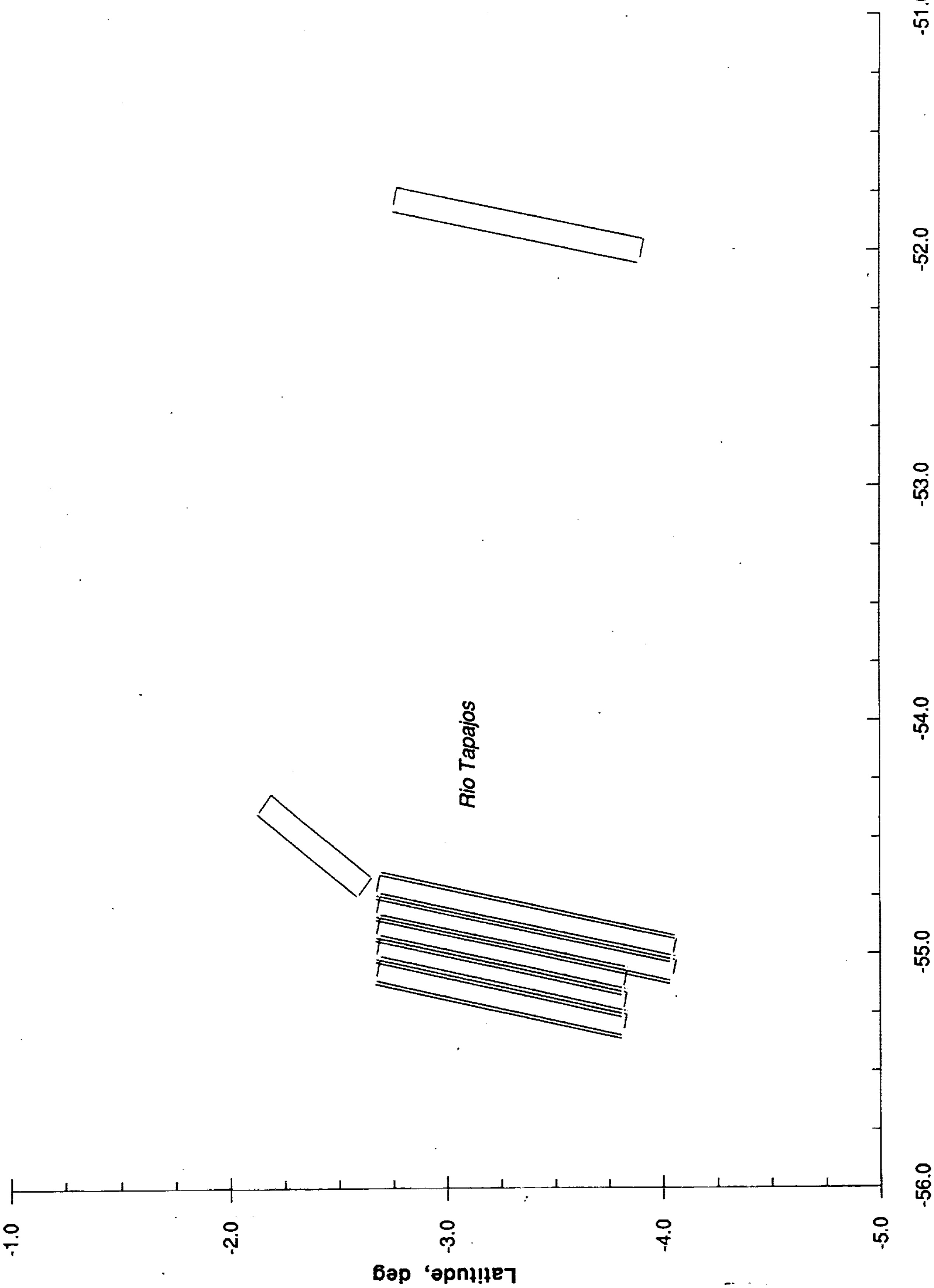

PACIFIC
OCEAN
COLOMBIA
Volcano transect
San Jose
del Guaviare
Araracuara
ECUADOR
PERU
BRAZIL
6
5
4
3
2
1
0
-1
-2
-3
-4
Latitude, deg
-81
-80
-79
-78
-77
-76
-75
-74
-73
-72
-71
-70
-69
-68
-67
Longitude, deg

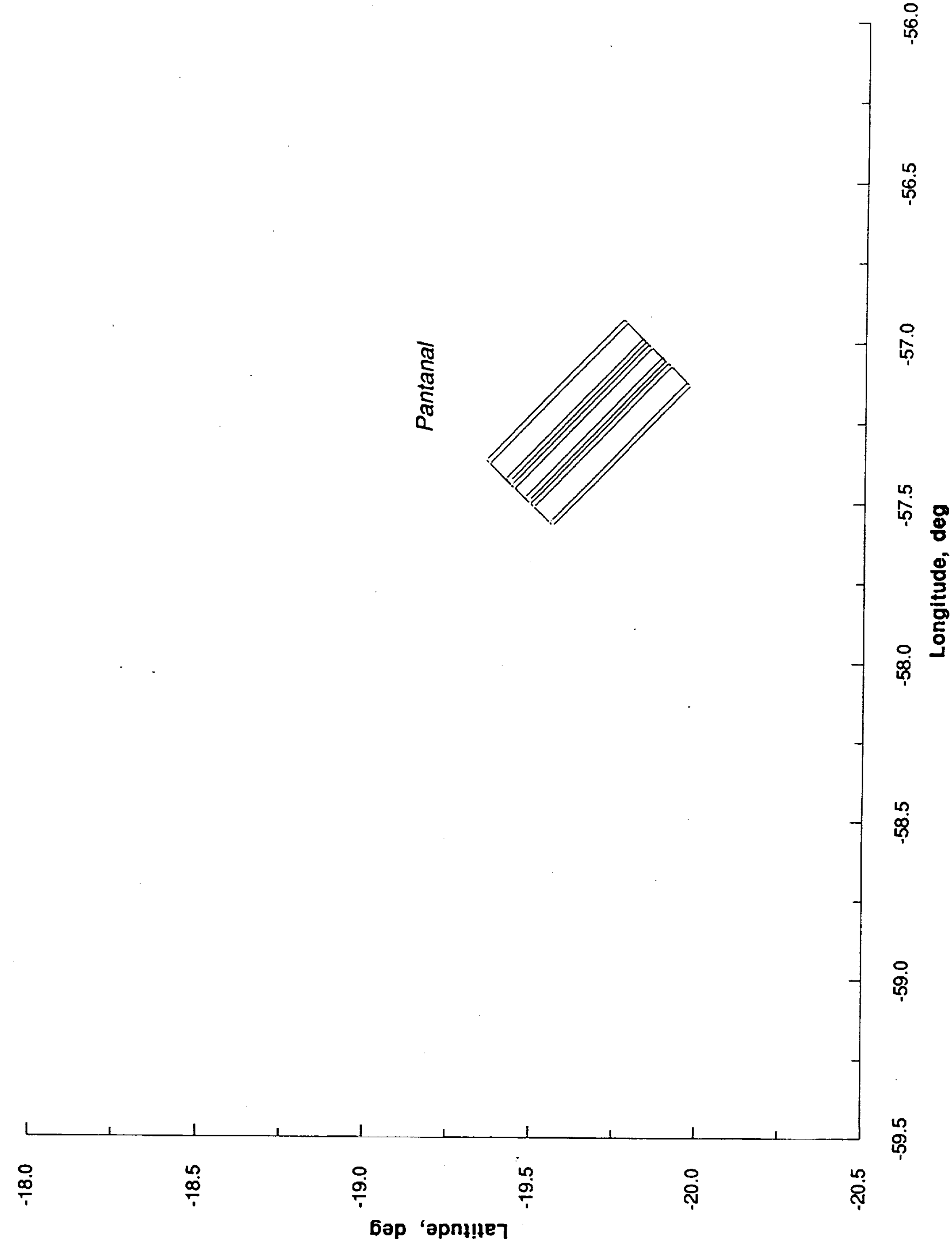

Manaus
Manaus
Rio Negro
Caballana
Longitude, deg
Latitude, deg
-59.00
-59.50
-60.00
-60.50
-61.00
-61.50
-62.00
-1.50
-2.00
-2.50
-3.00
-3.50
-4.00

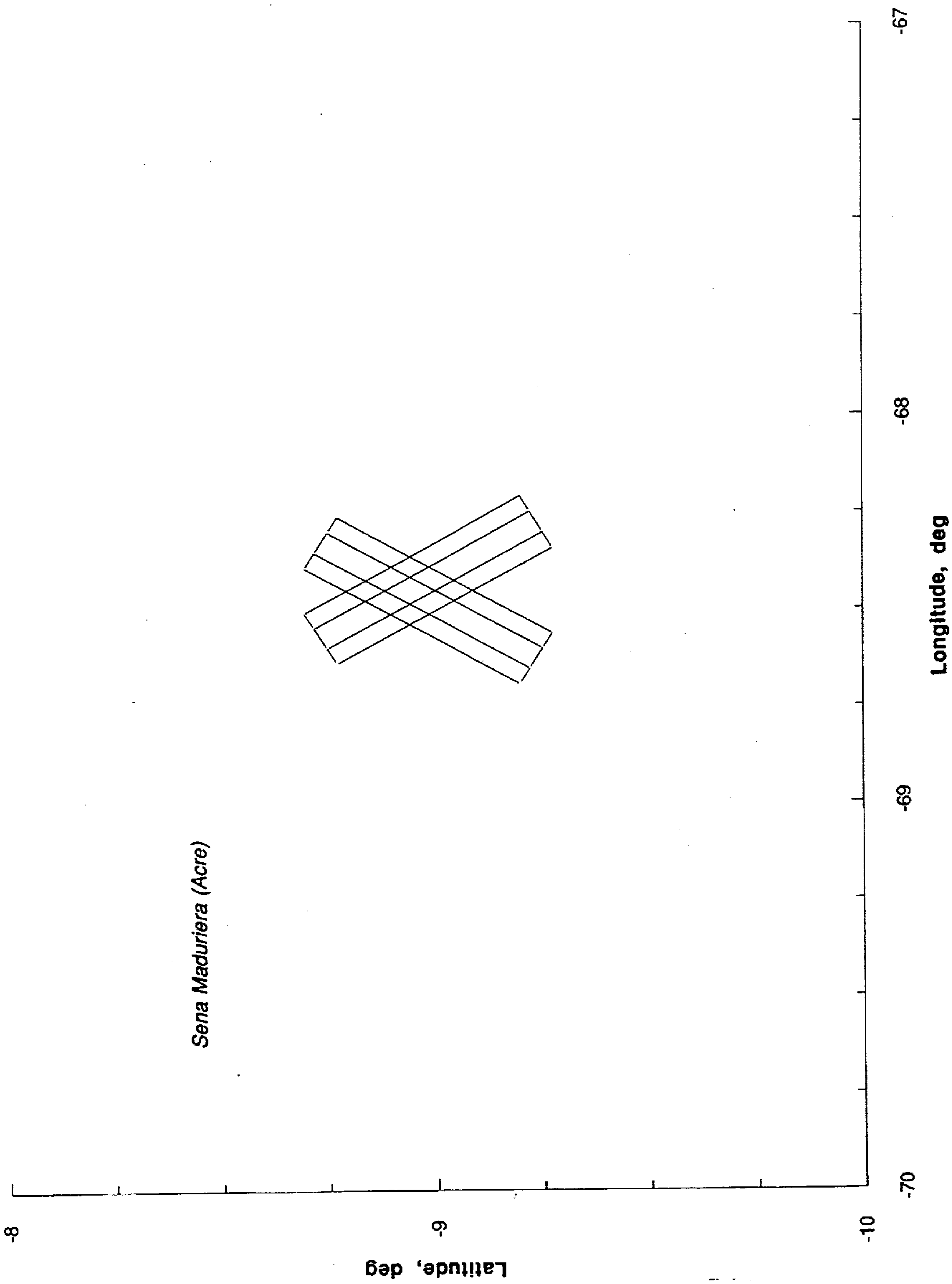


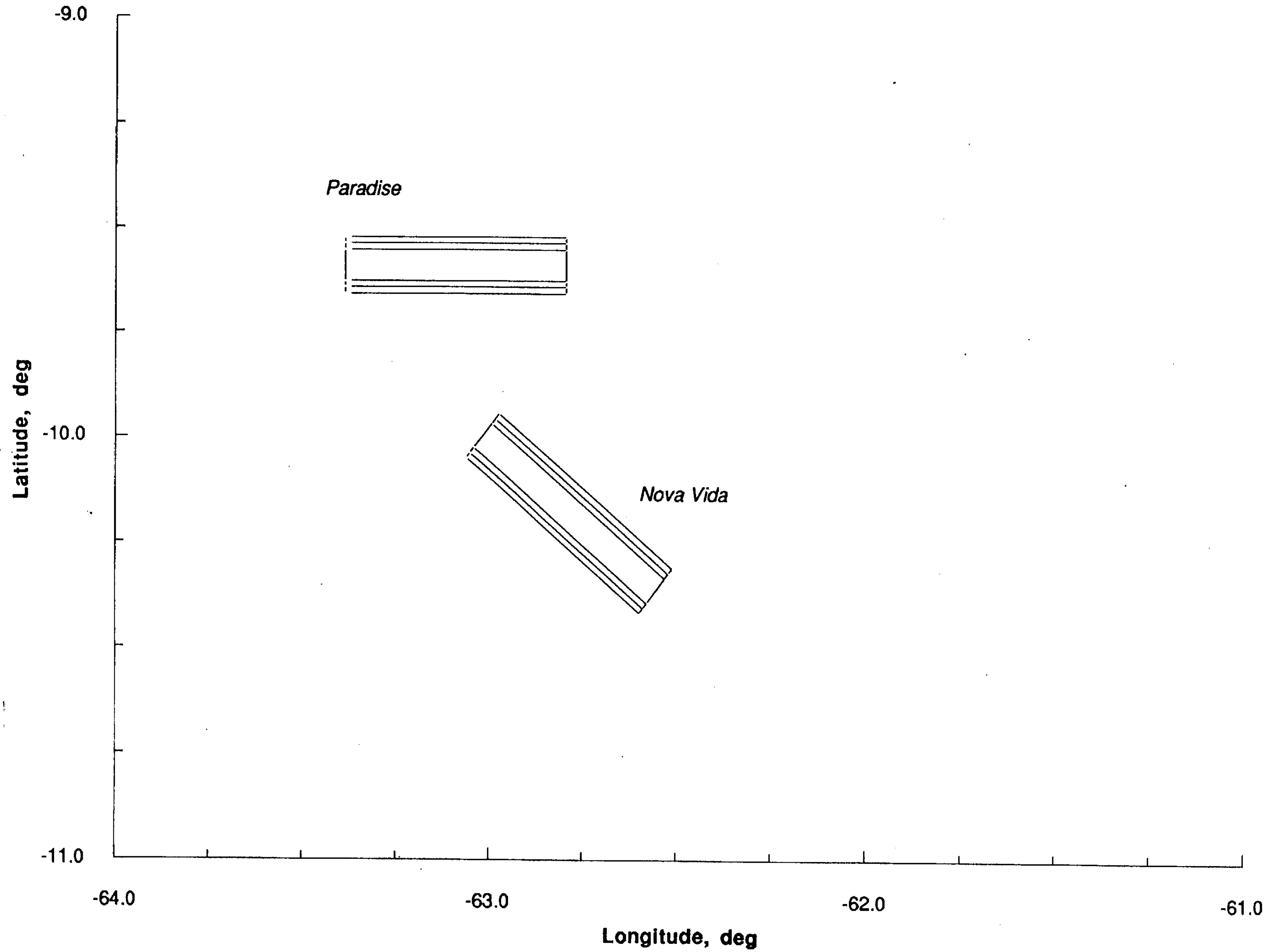
-8.0
-9.0
-10.0
Latitude, deg
Bebedouro
Curaca Valley
-41.0
-40.0
-39.0
Longitude, deg


Minas Gerais
-41.0
-42.0
-43.0
-44.0
Longitude, deg
-19.0
-20.0
-21.0
Latitude, deg


Rio Tapajos
-51.0
-52.0
-53.0
-54.0
-55.0
-56.0
Longitude, deg
-1.0
-2.0
-3.0
-4.0
-5.0
Latitude, deg


Pantanal
-56.0
-56.5
-57.0
-57.5
-58.0
-58.5
-59.0
-59.5
Longitude, deg
-18.0
-18.5
-19.0
-19.5
-20.0
-20.5
Latitude, deg


Sena Maduriera (Acre)
Longitude, deg
-67
-68
-69
-70
Latitude, deg
-8
-9
-10



-9.0
-10.0
-11.0
Latitude, deg
Paradise
Nova Vida
-64.0
-63.0
-62.0
-61.0
Longitude, deg

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. 93-16	2. Government Accession No.	3. Recipient's Catalog No.
4. Title and Subtitle PROCEEDINGS OF THE THIRD SPACEBORNE IMAGING RADAR SYMPOSIUM		5. Report Date May 28, 1993
		6. Performing Organization Code
7. Author(s)		8. Performing Organization Report No.
9. Performing Organization Name and Address JET PROPULSION LABORATORY California Institute of Technology 4800 Oak Grove Drive Pasadena, California 91109		10. Work Unit No.
		11. Contract or Grant No. NAS7-918
		13. Type of Report and Period Covered JPL External Publication
12. Sponsoring Agency Name and Address NATIONAL AERONAUTICS AND SPACE ADMINISTRATION Washington, D.C. 20546		14. Sponsoring Agency Code
15. Supplementary Notes		

16. Abstract

This publication contains summaries of the papers presented at the Third Spaceborne Imaging Radar Symposium held at the Jet Propulsion Laboratory (JPL), California Institute of Technology, in Pasadena, California, on January 18–21, 1993. The purpose of the symposium was to present an overview of recent developments in the different scientific and technological fields related to spaceborne imaging radars and to present future international plans.

This symposium is the third in a series of "Spaceborne Imaging Radar" symposia held at JPL. The first symposium was held in January 1983 and the second in 1986.

17. Key Words (Selected by Author(s)) 211.Geosciences & Oceanography (general); 326.Physics (general); radar; data processing; ecosystem; and remote sensing.	18. Distribution Statement Unclassified; unlimited

19. Security Classif. (of this report)	20. Security Classif. (of this page)	21. No. of Pages	22. Price
unclassified	unclassified	465	