Encontro das águas entre os rios Negro e Solimões – Observações hidrométricas durante o ciclo 2006/2007

River, Coastal and Estuarine Morphodynamics: RCEM 2009 – Vionnet et al. (eds)

The Rio Negro and Rio Solimões confluence point – hydrometric observations during the 2006/2007 cycle

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Backwater Effects in the Amazon River Basin of Brazil

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ABSTRACT / The Amazon River mainstem of Brazil is so regulated by differences in the timing of tributary inputs and by seasonal storage of water on floodplains that maximum discharges exceed minimum discharges by a factor of only 3. Large tributaries that drain the southern Amazon River basin reach their peak discharges two months earlier than does the mainstem. The resulting backwater in the lowermost 800 km of two large southern tributaries, the Madeira and Purús rivers, causes falling river stages to be as much as 2–3 m higher than rising stages at any given discharge. Large tributaries that drain the northernmost Amazon River basin reach their annual minimum discharges three to four months later than does the mainstem. In the lowermost 300–400 km of the Negro River, the largest northern tributary and the fifth largest river in the world, the lowest stages of the year correspond to those of the Amazon River mainstem rather than to those in the upstream reaches of the Negro River.

Introduction

Hydrologic data have been collected routinely in the Amazon River basin at least since the earliest years of this century. The longest continuous record of daily river stage in the Amazon River basin, that of the Negro River at Manaus, began in 1902 and continues to the present day. This and other records of river level served as the basis of early summaries by Pardé (1936, 1954, 1958) of the hydrology of the Amazon River and its tributaries. Following the pioneering measurements of river discharge made in 1963–1964 (Oltman and others 1964; Oltman 1968; Sternberg and Pardé 1965), a comprehensive program of regular discharge measurement along the Amazon River mainstem and along selected tributaries was begun during the early 1970s by Brazil's Departamento Nacional de Aguas e Energia Eletrica (DNAEE) with the collaboration of Companhia de Pesquisas de Recursos Minerais (CPRM) and Hidrologia S.A. (Divisão de Aguas 1968). This program was expanded during the late 1970s to include discharge measurements along the Negro River, the last major tributary to be gaged regularly in the Amazon River basin. Stage and discharge data collected at stations shown in Figure 1 are the basis of this report. Unless otherwise noted, all data in this report were collected for DNAEE by CPRM and Hidrologia S.A.

The purpose of this report is to use the newer data to demonstrate some of the hydrologic characteristics of the world's largest river system. Our approach is descriptive and pictorial. The first four figures and the accompanying discussion describe some of the general features of the hydrology of the Amazon River mainstem and two of its major tributaries. The remaining figures and discussion focus on some of the impressive effects of backwater—especially the extent to which the Amazon River mainstem causes backwater in other rivers that themselves rank among the half dozen largest in the world.

Hydrologic Setting

On the basis of the average discharge at its mouth (200,000 m^3/sec), the Amazon ranks as the world's largest river. On the same basis, two of its tributaries, the Negro and Madeira rivers, rank as fifth and sixth largest. Second, third, and fourth in the same ranking are the Congo (Zaire), Orinoco, and Yangtze (Changjiang) rivers. The Mississippi River ranks about tenth and has an average discharge (including that of the Red and Atchafalaya rivers) about one-twelfth the discharge of the Amazon. The total area drained by the Amazon River and its tributaries is about 6.15×10^6 km^2. Recent summaries of the hydrology and hydrography of the Amazon basin have been published by Sternberg (1975), Sioli (1984), and Salati (1985).

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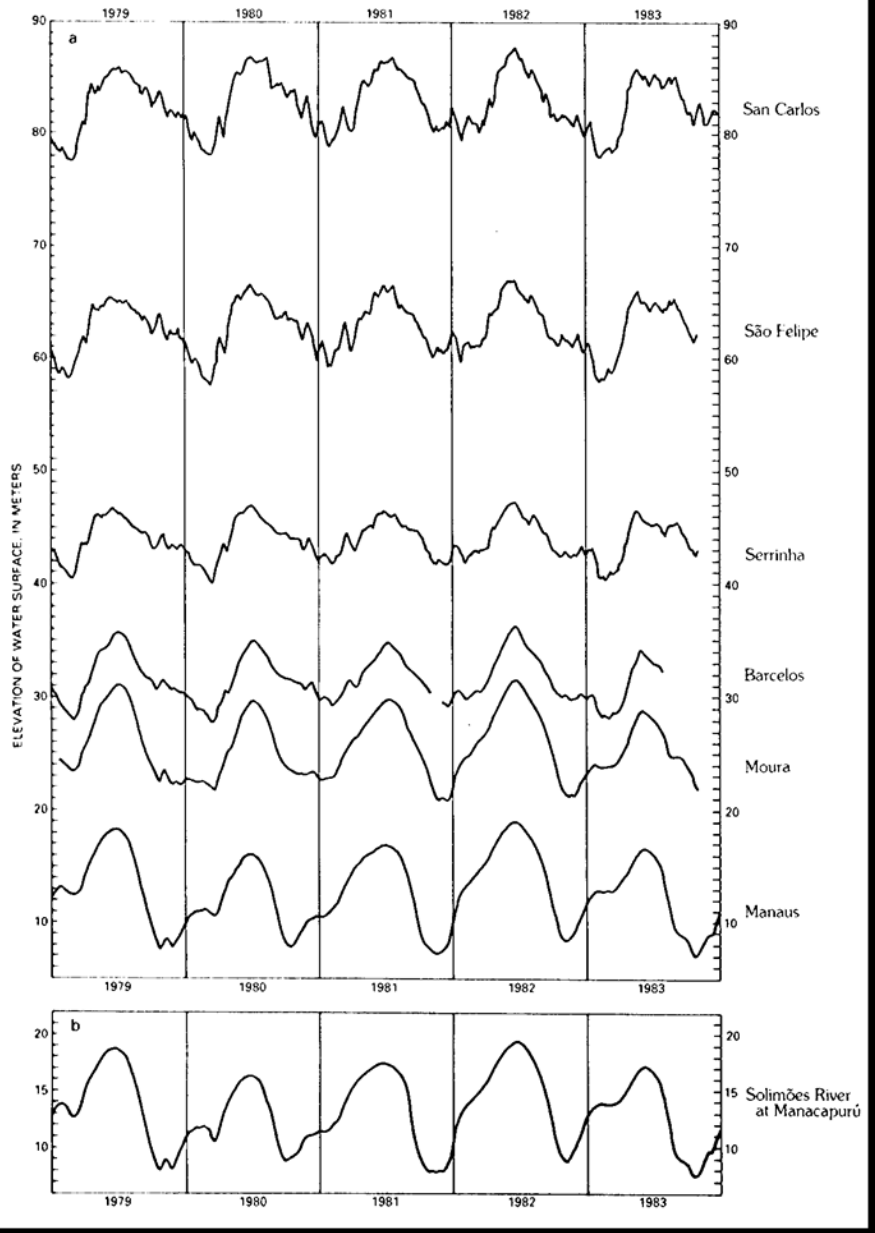

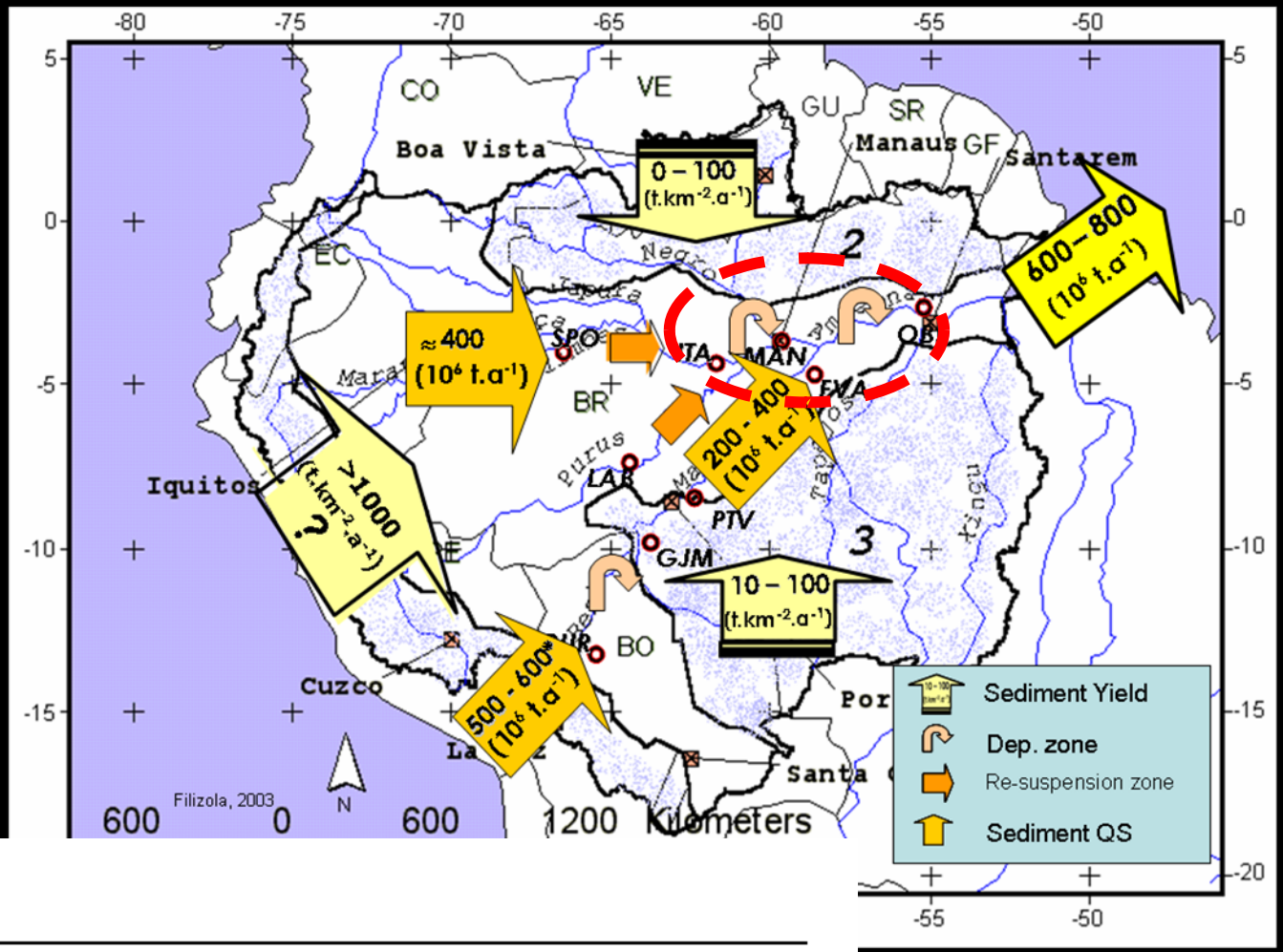

HYDROLOGICAL PROCESSES
(IN PRESS - 2008)

Suspended sediment Yield in the Amazon basin. An assessment using the Brazilian national data set

Naziano Filizola[1] and Jean Loup Guyot[2]

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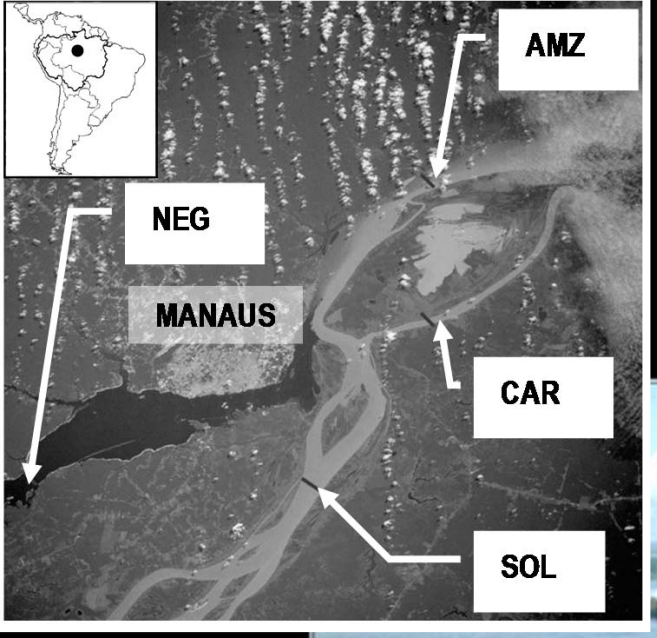
[2] *Institut de Recherche pour le Développement-iRD, UR 154 LMTG, Casilla 18-1209, Lima 18, Peru*

O “Encontro das Águas”



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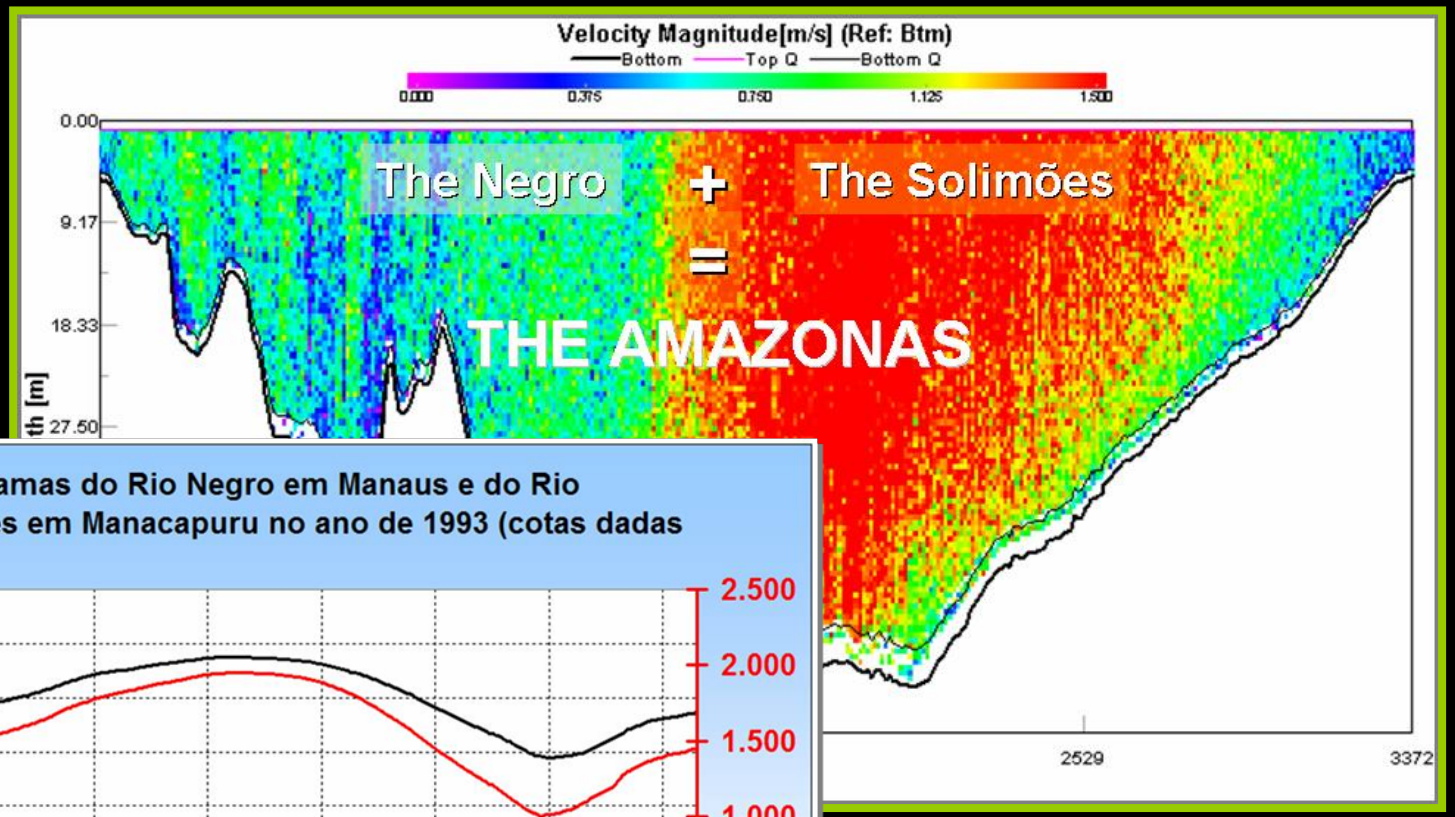
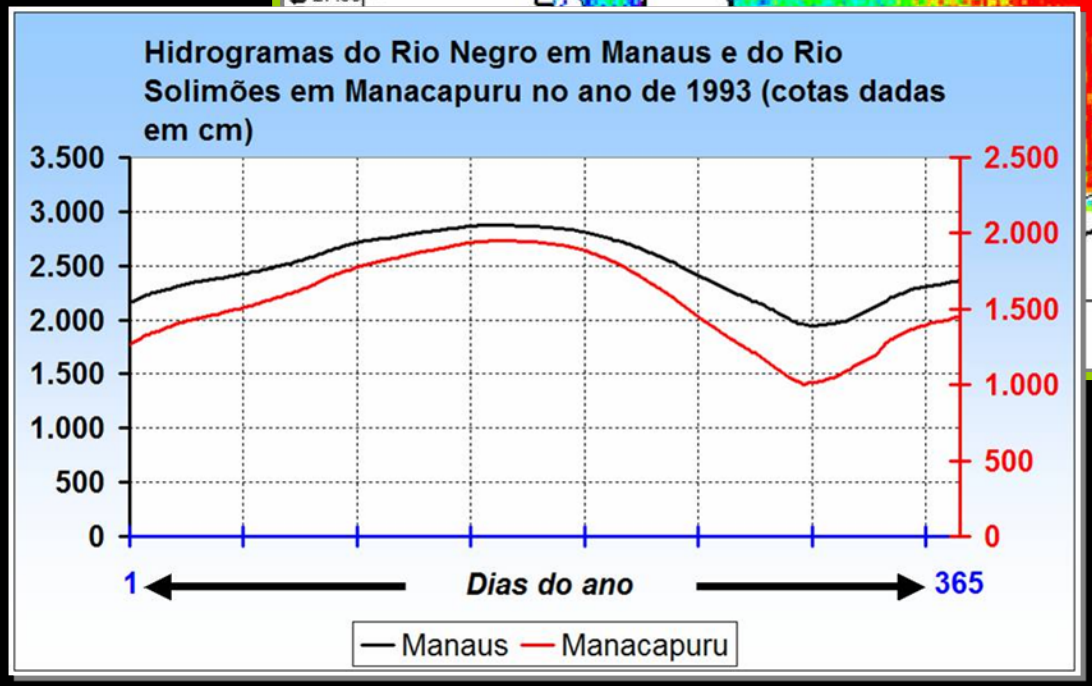
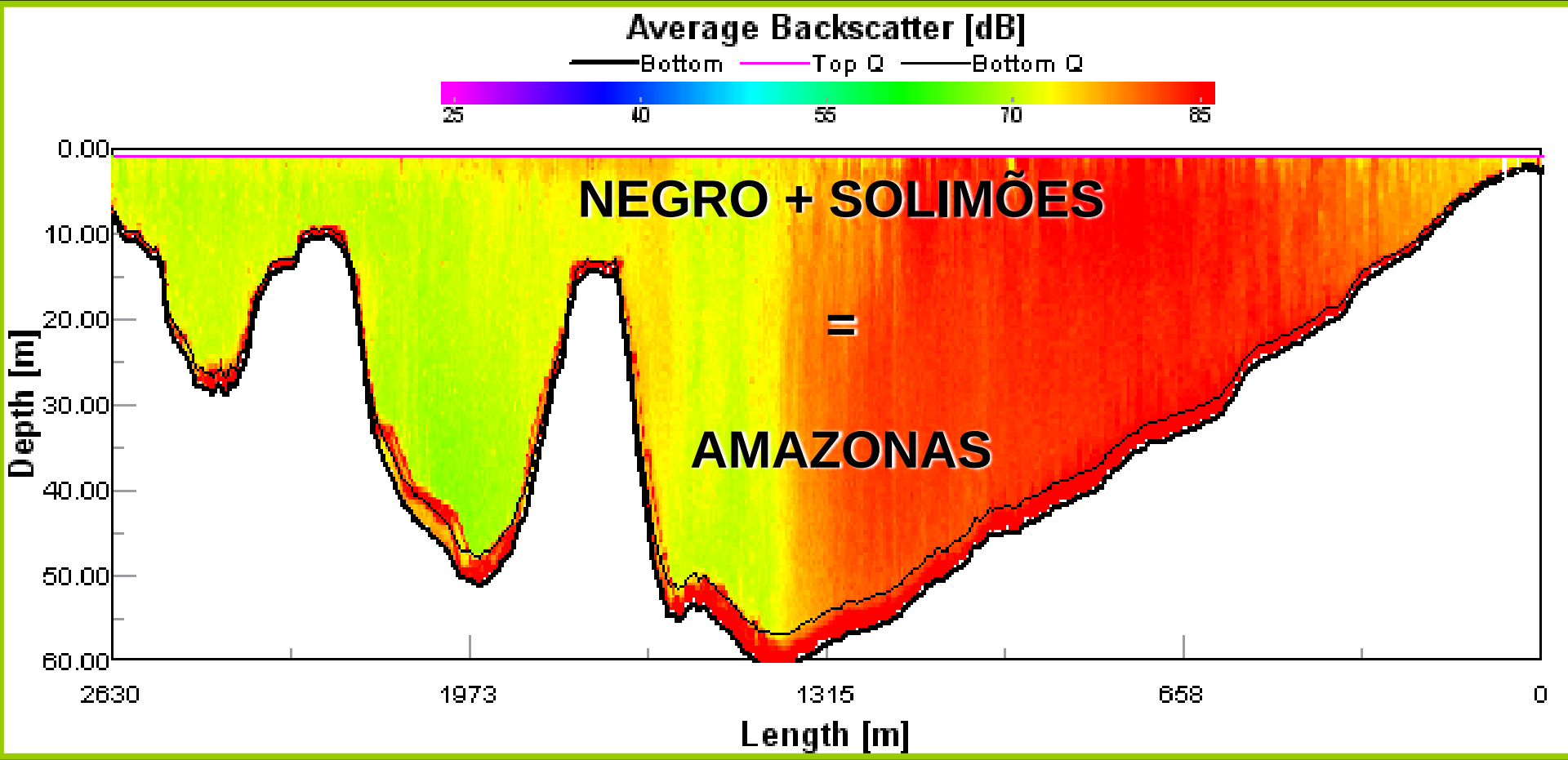
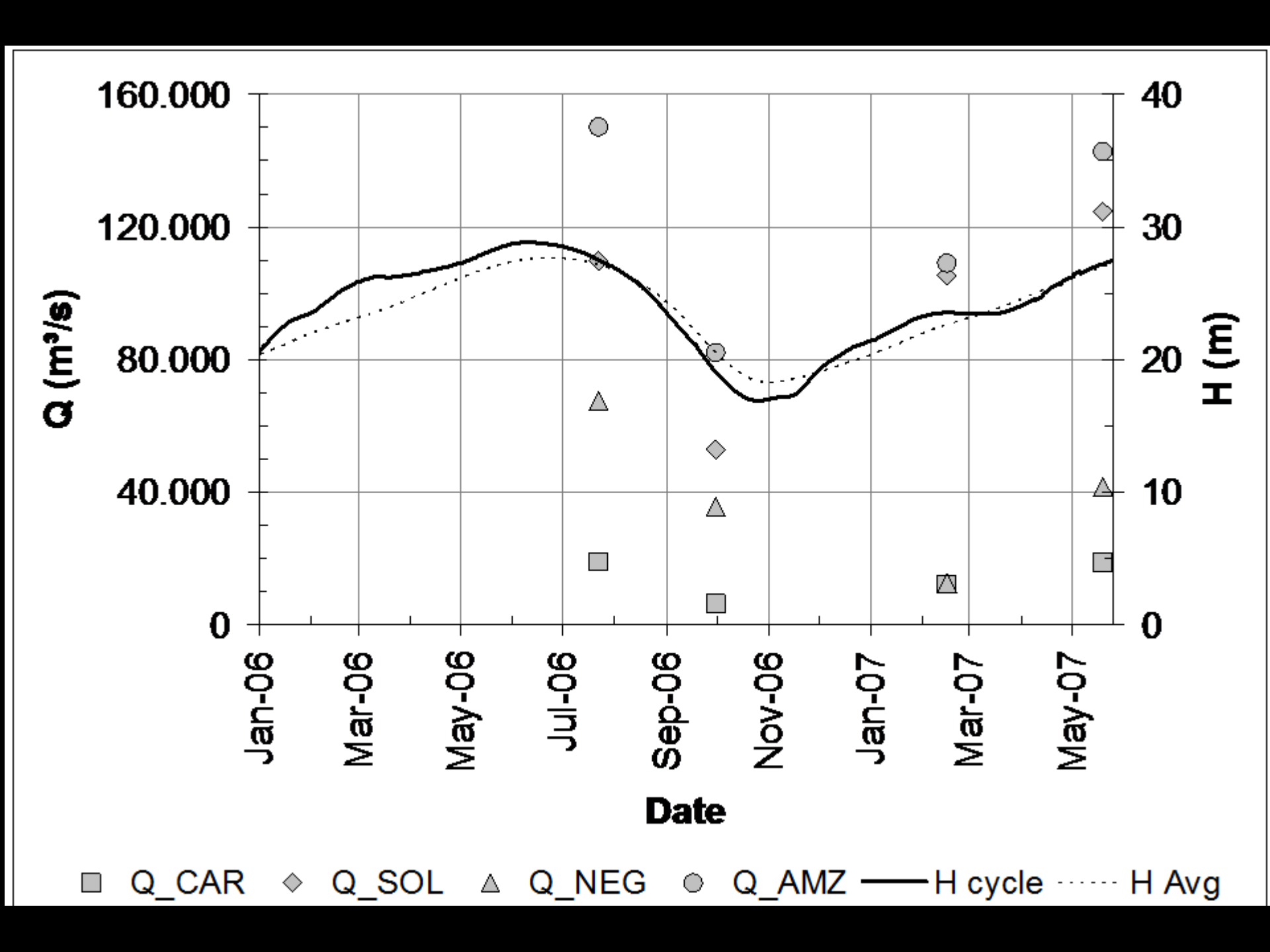
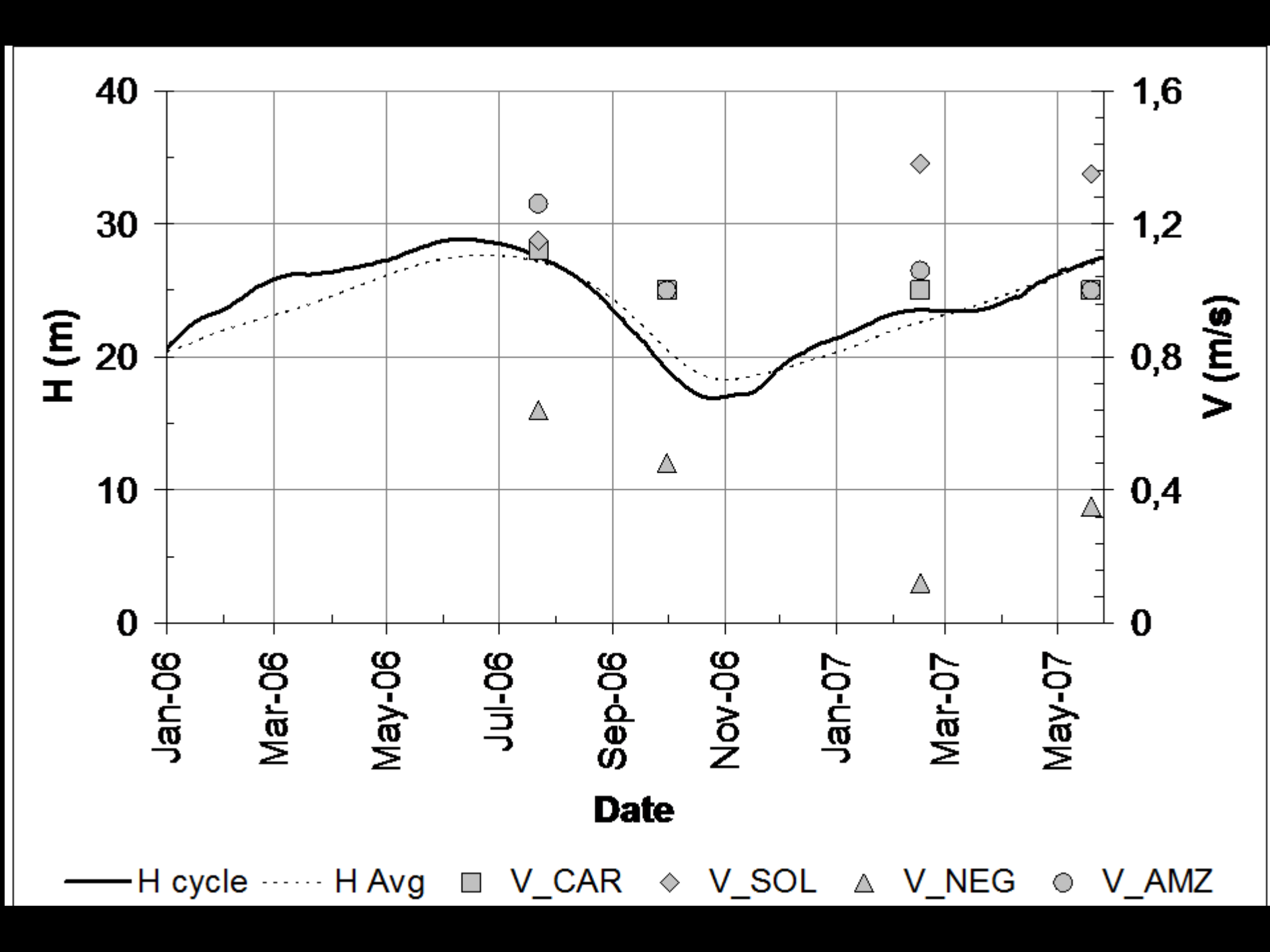
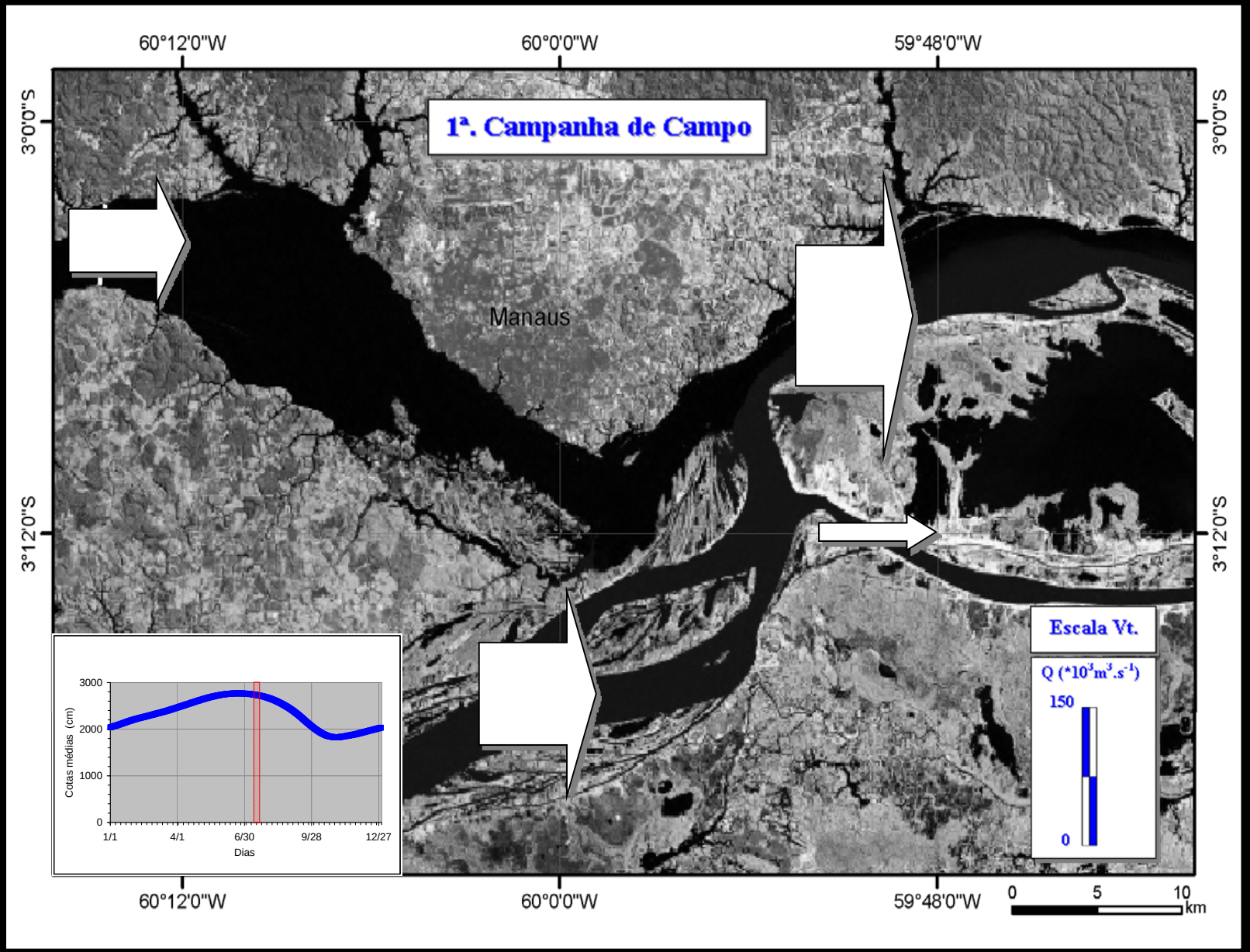


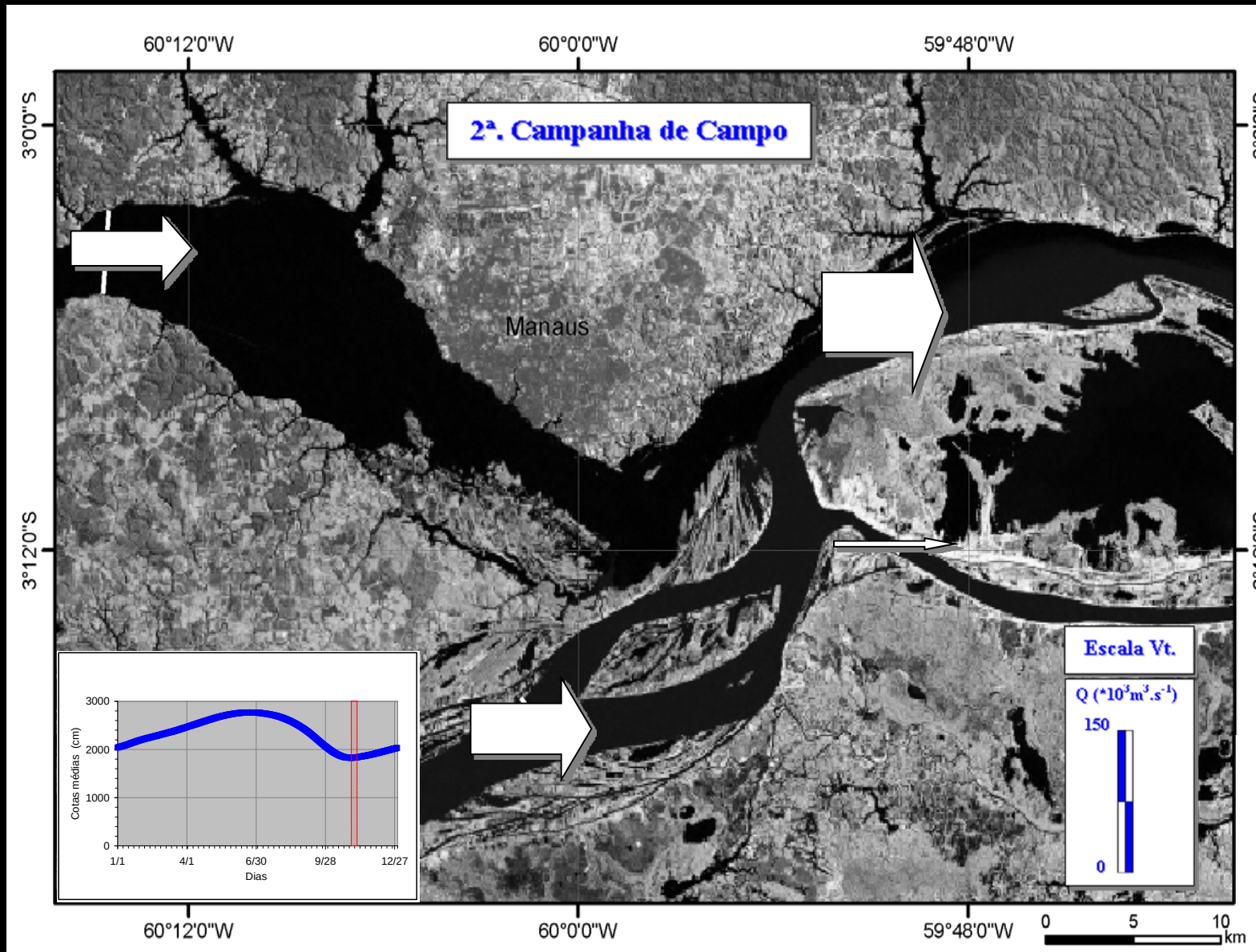


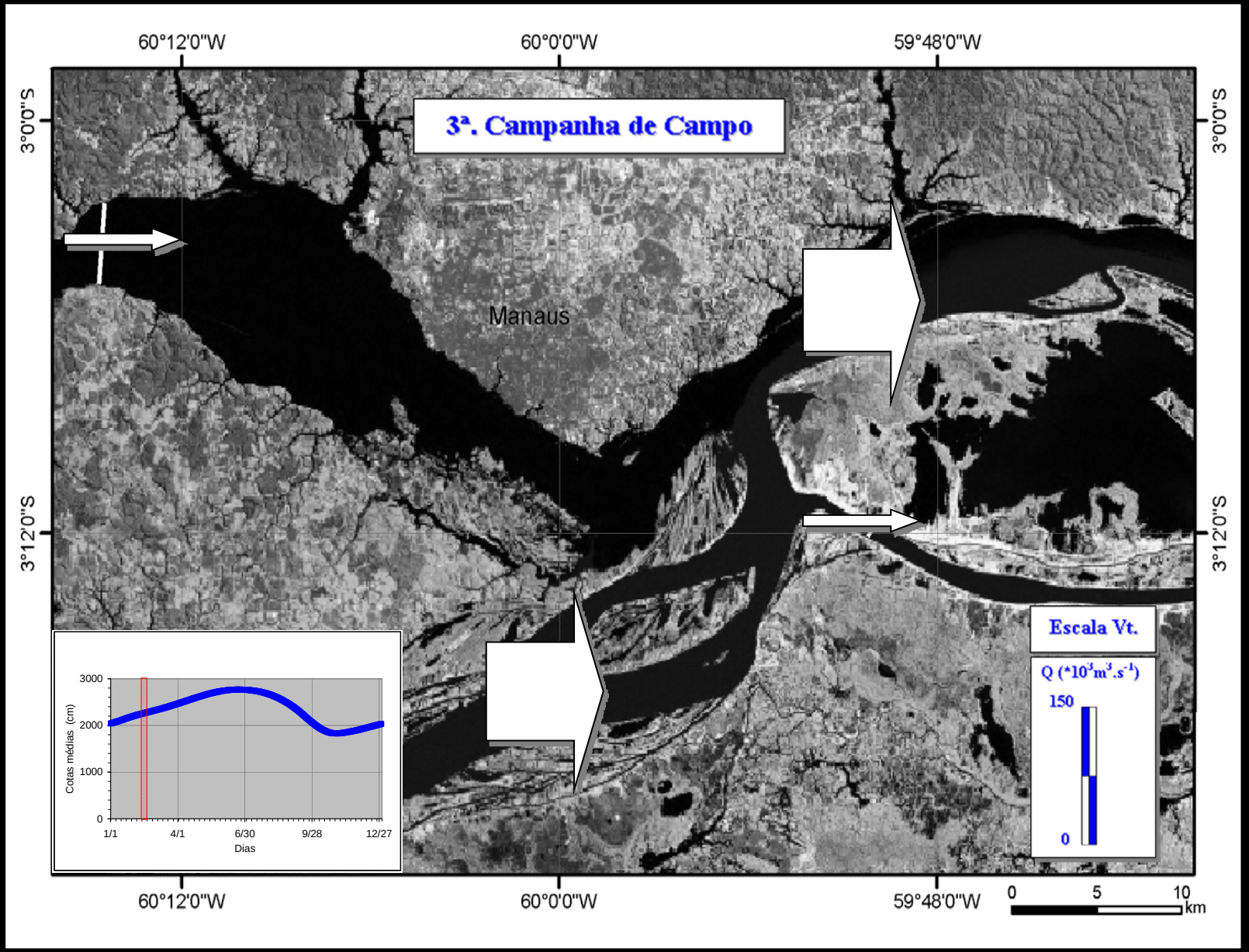

Average Backscatter [dB]
Bottom
Top Q
Bottom Q
25
40
55
70
85
NEGRO + SOLIMÕES
=
AMAZONAS
Depth [m]
0.00
10.00
20.00
30.00
40.00
50.00
60.00
2630
1973
1315
658
0
Length [m]

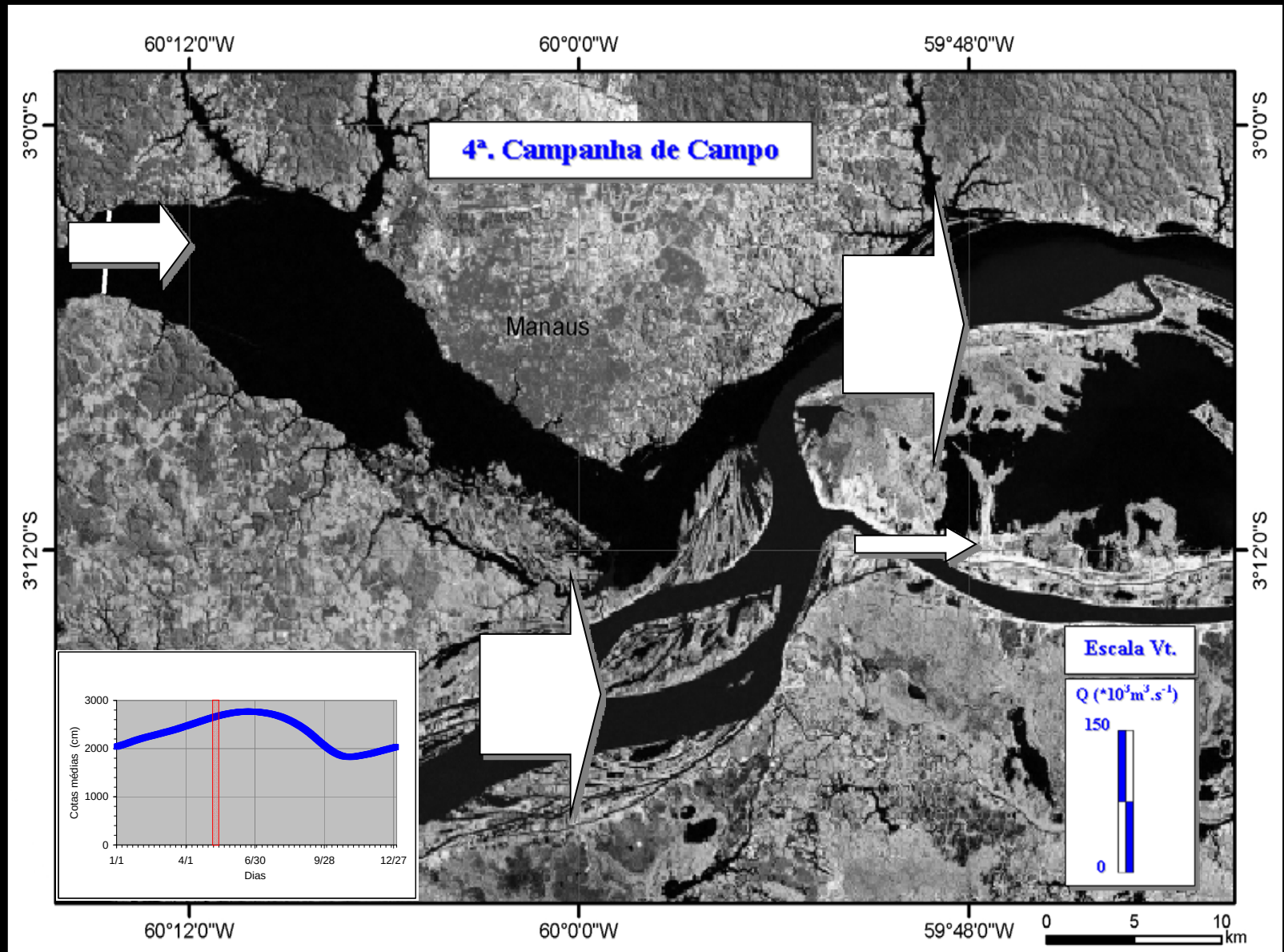

160.000
120.000
80.000
40.000
0
Q (m³/s)
40
30
20
10
0
H (m)
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Date
Q_CAR
Q_SOL
Q_NEG
Q_AMZ
H cycle
H Avg

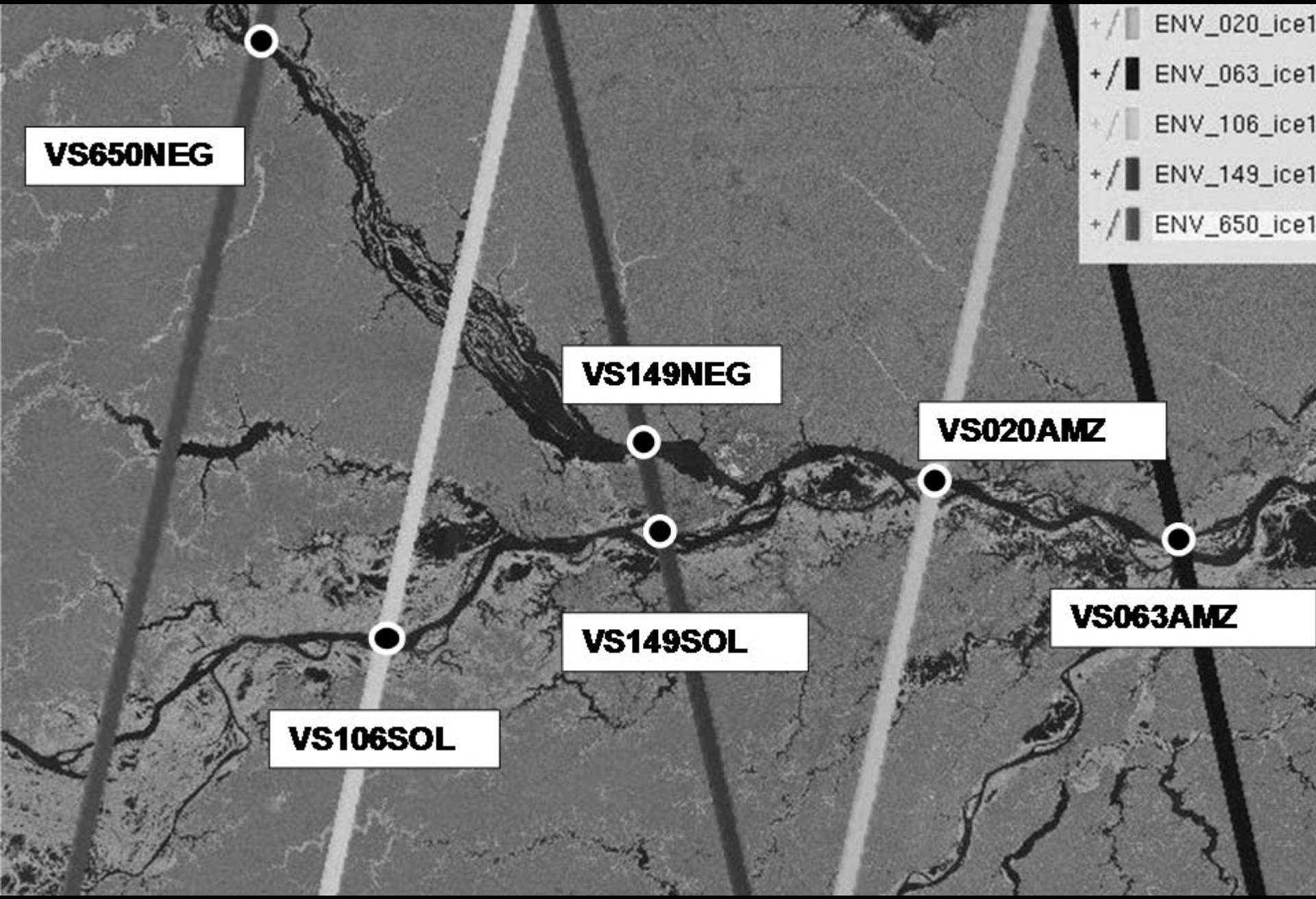

40
30
20
10
0
H (m)
1,6
1,2
0,8
0,4
0
V (m/s)
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Date
H cycle
H Avg
V_CAR
V_SOL
V_NEG
V_AMZ


1ª. Campanha de Campo
60°12'0"W
60°0'0"W
59°48'0"W
3°0'0"S
3°12'0"S
Manaus
Escala Vt.
Q (*10-3m3.s-1)
150
0
Cotas médias (cm)
3000
2000
1000
0
1/1
4/1
6/30
9/28
12/27
Dias
0
5
10
km


2ª. Campanha de Campo
60°12'0"W
60°0'0"W
59°48'0"W
3°0'0"S
3°12'0"S
Manaus
Escala Vt.
Q (*10⁻³m³.s⁻¹)
150
0
Cotas médias (cm)
3000
2000
1000
0
1/1
4/1
6/30
9/28
12/27
Dias
0
5
10
km


3ª. Campanha de Campo
Manaus
60°12'0"W
60°0'0"W
59°48'0"W
3°0'0"S
3°12'0"S
Escala Vt.
Q (*10³m³.s⁻¹)
150
0
Cotas médias (cm)
3000
2000
1000
0
1/1
4/1
6/30
9/28
12/27
Dias
0
5
10
km


4ª. Campanha de Campo
Manaus
60°12'0"W
60°0'0"W
59°48'0"W
3°0'0"S
3°12'0"S
Escala Vt.
Q (*10³m³.s⁻¹)
150
0
Cotas médias (cm)
3000
2000
1000
0
1/1
4/1
6/30
9/28
12/27
Dias
0
5
10
km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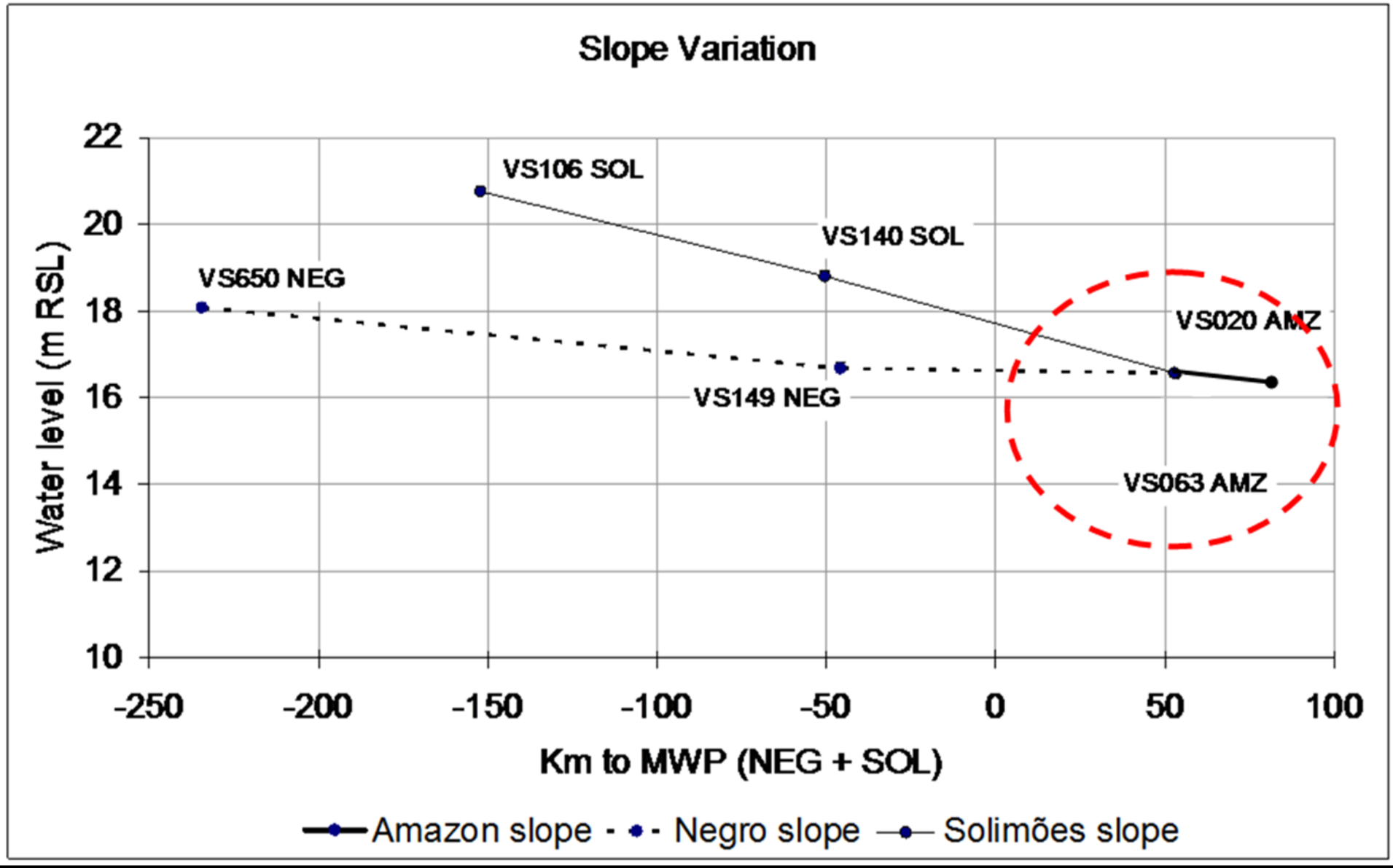
Slope Variation
22
20
18
16
14
12
10
Water level (m RSL)
VS106 SOL
VS140 SOL
VS650 NEG
VS020 AMZ
VS149 NEG
VS063 AMZ
-250
-200
-150
-100
-50
0
50
100
Km to MWP (NEG + SOL)
Amazon slope
Negro slope
Solimões slope

OBRIGADO !

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