

Tabla 6.3.1 Descarga Mensual del Río Morichal Largo y Río Tigre

Station	Item	Unit	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Morichal Largo en Puente Moritipo(5,000 km2)	PROM:	m3/s	45.3	40.2	38.6	37.6	39.4	45.1	50.4	49.8	46.1	44.1	45.4	42.7	43.7
	PORC:		8.6	7.7	7.3	7.2	7.5	8.6	9.6	9.5	8.8	8.4	8.7	8.1	
	D.STD:		7.1	2.6	2.0	1.9	5.7	5.9	4.6	3.8	4.2	2.3	4.9	3.3	
	CV:		15.7	6.5	5.2	5.0	14.4	13.2	9.1	7.7	9.1	5.2	10.8	7.7	
	MAX:	m3/s	63.9	48.9	44.1	44.1	59.0	63.2	69.2	65.3	66.8	56.9	61.8	52.5	69.2
	D.STD:		9.4	3.5	2.6	2.6	7.9	7.1	8.2	5.6	7.8	4.5	6.4	4.8	
	CV:		19.3	8.1	6.4	6.6	18.1	13.3	13.6	9.7	14.4	9.2	12.3	10.3	
	MIN:	m3/s	36.6	30.3	35.4	35.0	34.7	36.1	38.7	38.3	38.7	38.3	37.9	36.3	30.3
	D.STD:		3.1	3.8	2.1	1.8	2.9	3.1	4.8	3.6	2.5	2.1	3.4	2.5	
	CV:		7.7	10.3	5.6	4.9	7.9	7.8	10.7	8.3	6.0	5.1	8.1	6.4	
Tigre en Puente Tigre(7,000 km2)	PROM:	m3/s	38.3	32.5	28.9	30.6	37.9	57.9	86.3	91.9	79.2	64.3	56.6	45.5	54.2
	PORC:		5.9	5.0	4.5	4.7	5.8	8.9	13.3	14.1	12.2	9.9	8.7	7.0	
	D.STD:		9.6	7.6	5.7	14.6	23.7	22.6	36.2	31.9	24.0	16.6	17.9	10.2	
	CV:		25.0	23.5	19.6	47.7	62.5	39.0	42.0	34.7	30.3	25.8	31.6	22.3	
	MAX:	m3/s	76.6	66.1	52.7	236.6	236.6	149.8	220.4	267.5	210.7	149.0	160.5	83.0	267.5
	D.STD:		16.3	10.9	7.3	47.7	51.3	34.7	53.7	44.7	39.3	26.6	27.3	14.2	
	CV:		34.2	30.4	22.9	114.2	84.4	40.9	44.8	35.5	33.1	27.7	34.9	24.5	
	MIN:	m3/s	24.3	23.6	20.0	16.5	19.1	24.3	27.3	32.6	31.2	29.7	27.7	26.4	16.5
	D.STD:		7.5	6.6	5.3	5.8	13.2	17.9	24.9	22.3	17.7	12.8	8.7	8.1	
	CV:		22.4	21.5	19.3	22.1	43.9	44.3	41.3	36.8	33.3	26.8	20.0	21.2	

Source: MARNR

Tabla 6.3.2

Submodel	Branch Name	Chainage(m)		Location		Calibration of 1994-1999		Bed Material d50(mm)
		from	to	from	to	Cross Section 1995 Navigation Chart	Main Channel Roughness "n"	
Whole Delta Model	RioGrande	0	272,000	Palua		Boca Grande	0.033	0.40
	RioGrande2	0	87,000	Isia Jebolina		Isias Papagayos	0.033	0.40
	RioGrande3	0	17,065	Isia Chivera Sur		Isiote Barrancas	0.033	0.40
	Igana	0	11,000	Isia Igana		Punta Cabrian	0.033	0.40
	Tortola	0	20,000	Isia Varadero Norte		Isia Playa del Medio	0.033	0.40
	Barrancas	0	2,200	Barrancas		Isiote Barrancas	0.033	0.40
	Piacoa	0	50,000	Punta Cabrian		Socoroco	0.033	0.40
	Cano Tres	0	9,500	Isia Tres		-	0.033	0.40
	Isia Tortola	0	30,000	Ya-Ya		Isia Inglesa	0.033	0.40
	Portuesa	0	6,000	Isia Portuguesa		-	0.033	0.40
	Socoroco	0	11,000	Isia Portuguesa		Isia Jebolina	0.033	0.40
	Caiman	0	4,500	Isia Caiman		-	0.033	0.40
	Remolinos	0	18,000	Rio Grande		Isia Remolinos	0.033	0.40
	Fiscal	0	16,000	-		Isia Diego Perez	0.033	0.40
	Diego Perez	0	9,000	Isia Diego Perez		-	0.033	0.40
	Araguaito	0	179,000	Ya-Ya		Atlantic Ocean	0.033	0.40
	Sucupana	0	119,000	Isia Guasina		Atlantic Ocean	0.033	0.40
	Merejino	0	74,000	Rio Grande		Atlantic Ocean	0.033	0.40
Manamno,Macareo	RB_1	0	18,300			Atlantic Ocean	0.033	0.40
	RB_2	0	29,800			Atlantic Ocean	0.033	0.40
	RB_3	0	800				0.033	0.40
	RB_4	0	9,000				0.033	0.40
	RB_5	0	62,000			Atlantic Ocean	0.033	0.40
	RB_6	0	1,000				0.033	0.40
	Macareo	0	193,739	Isolate Barrancas		Pescadoles	0.033	0.25
	Tucupita	0	89,000	Tucupita		-	0.033	0.20
	Manamno	0	203,101	Macareo		Pedernales	0.033	0.20
	Manamito	0	51,003	Tucupita		-	0.033	0.20
	Pedernales	0	136,000	Tucupita		Pedernales	0.033	0.20
	Manamno2	0	26,000	-		Atlantic Ocean	0.033	0.20
	MN_Tigre	0	13,465	-			0.033	0.20
	MN_DEVG	0	9,922	-			0.033	0.20
	MN_DEV5	0	7,958	-			0.033	0.20
	MN_Manamno3	0	7,670	-		Atlantic Ocean	0.033	0.20

Tabla 6.3.3 Condiciones de los Límites en el Modelo del Delta del Orinoco

Boundary Type	Branch	Chainage in m	HD	ST	Description
Discharge	Manamo	150,000	○	○	Rio Tigre Discharge
	Manamo	133,000	○	○	Morichal
	Manamo	85,660	○	○	Uracoa
	Rio Grande	59,670	○	○	Matamata
	Piacoa	22,700	○	○	Manaco
	Rio Grande	133,700	○	○	Socoroco
	Diego Perez	2,000	○	○	Imataca
	Rio Grande	0	○	○	Palua
Waterlevel	Rio Grande	272,000	○	○	Isla Tercela Tide(*2)
	Pedernales	136,000	○	○	Pedernales Tide(*1)
	Manamo	203,101	○	○	Pedernales Tide(*1)
	Manamo2	26,000	○	○	Pedernales Tide(*1)
	MN_Manamo3	7,670	○	○	Pedernales Tide(*1)
	Macareo	193,739	○	○	Isla Tercela Tide(*2)
	Merejino	74,000	○	○	Isla Tercela Tide(*2)
	Araguaito	179,000	○	○	Isla Tercela Tide(*2)
	RB_1	18,300	○	○	Isla Tercela Tide(*2)
	RB_2	29,800	○	○	Isla Tercela Tide(*2)
	RB_5	62,000	○	○	Isla Tercela Tide(*2)
Sediment Transport Rate	Rio Grande	0		○	$15 \times 10^6 \text{ m}^3/\text{year}$
Bed Elevation Change	Rio Grande	272,000		○	$dz/dt=0$
	Pedernales	136,000		○	$dz/dt=0$
	Manamo	203,101		○	$dz/dt=0$
	Manamo2	26,000		○	$dz/dt=0$
	MN_Manamo3	7,670		○	$dz/dt=0$
	Macareo	193,739		○	$dz/dt=0$
	Merejino	74,000		○	$dz/dt=0$
	Araguaito	179,000		○	$dz/dt=0$
	RB_1	18,300		○	$dz/dt=0$
	RB_2	29,800		○	$dz/dt=0$
	RB_5	62,000		○	$dz/dt=0$
Control Structure	Manamo	14,955	○	○	Manamo Gate- Waterlevel Control

note:

*1) The measured water level by JICA in 1998-1999

*2) The tide projection by INC

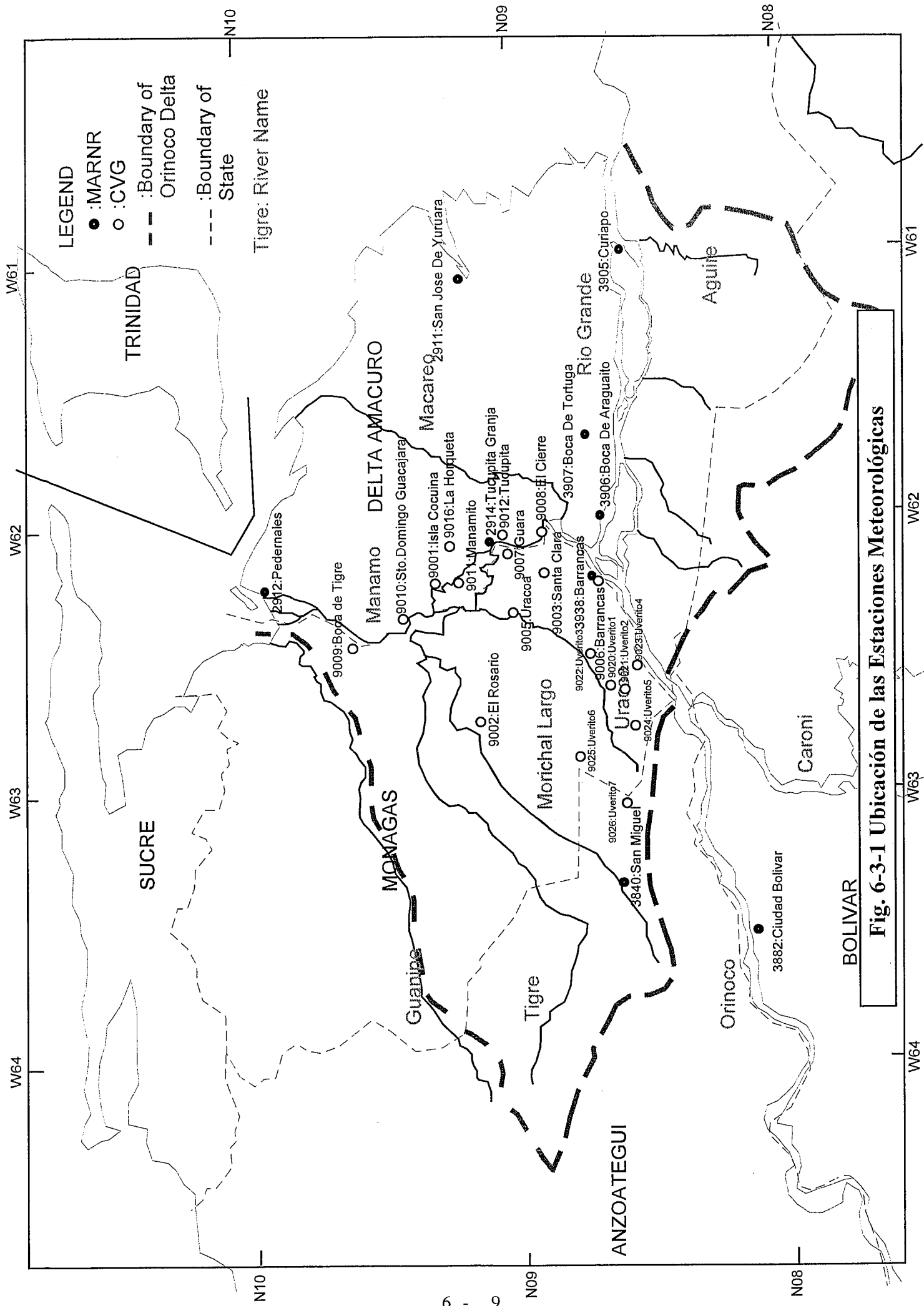
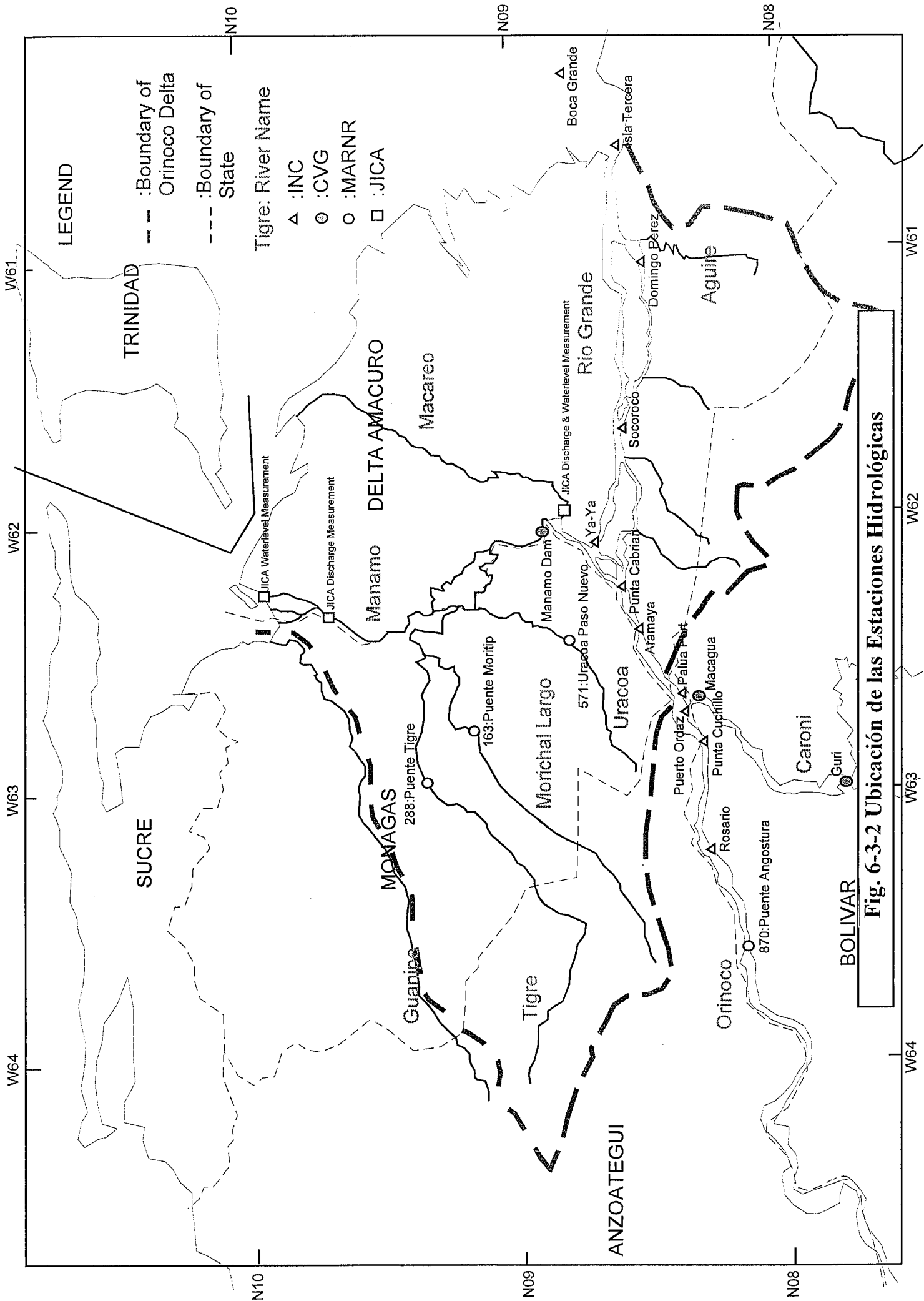


Fig. 6-3-1 Ubicación de las Estaciones Meteorológicas



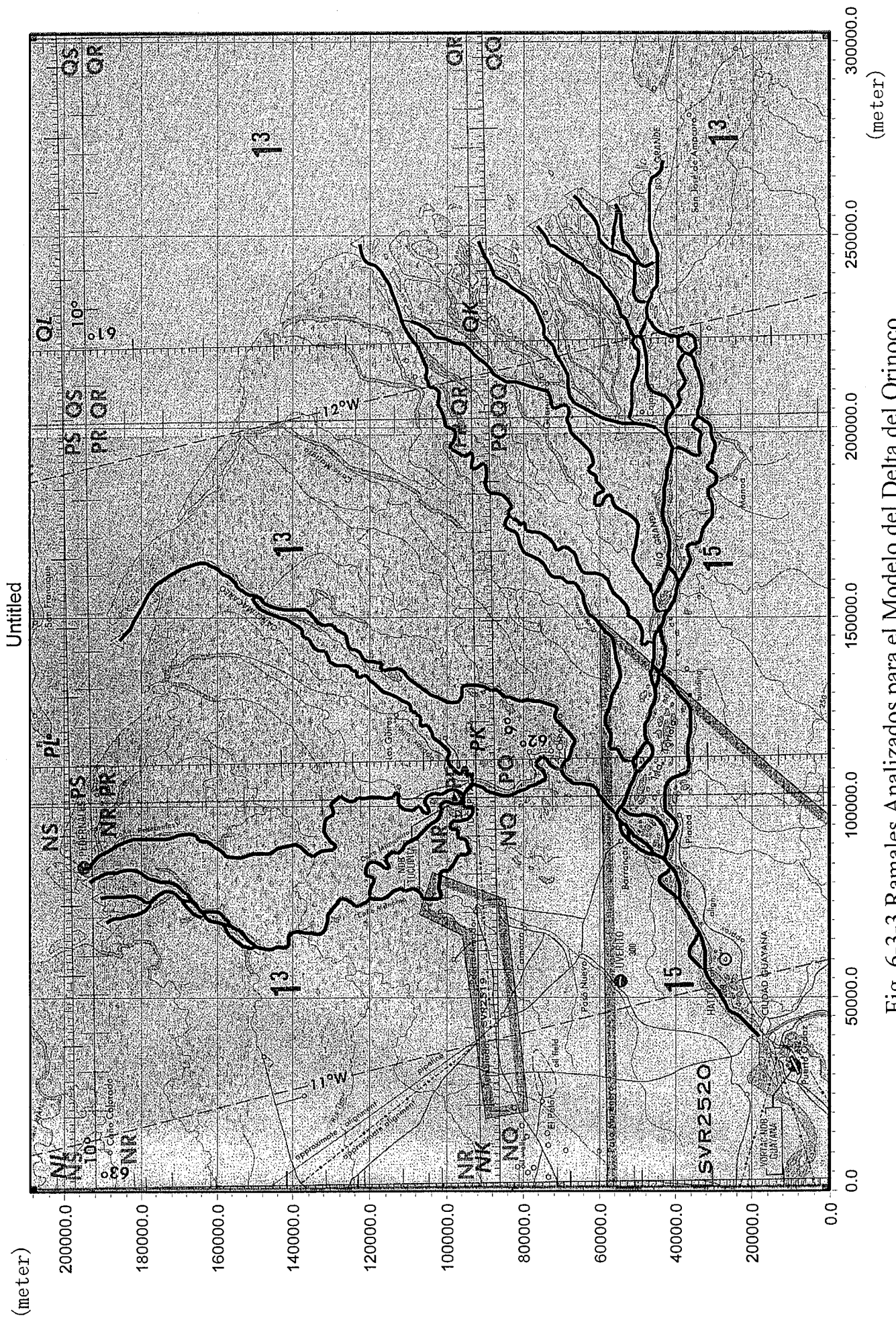
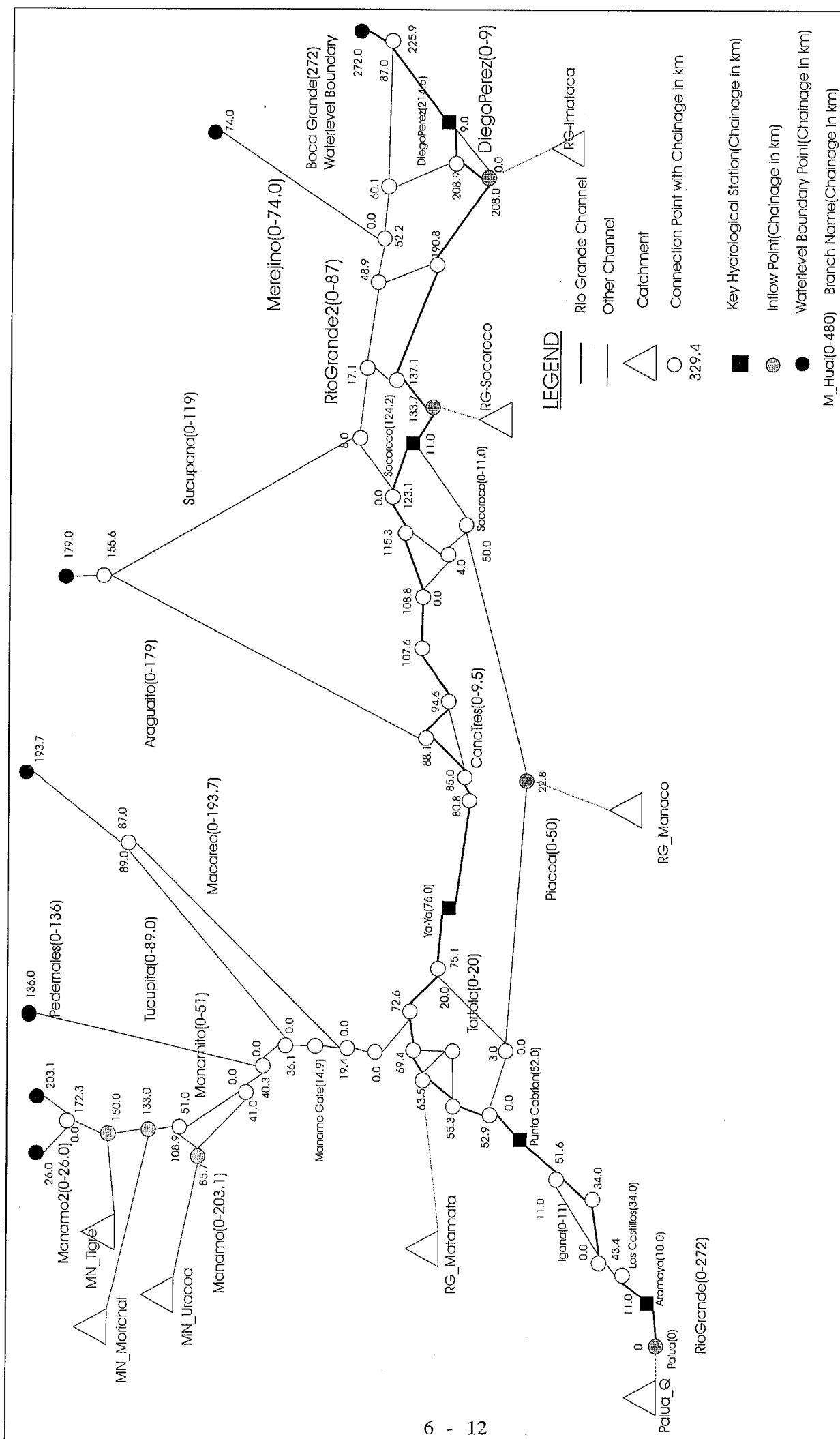


Fig. 6-3-3 Ramales Analizados para el Modelo del Delta del Orinoco



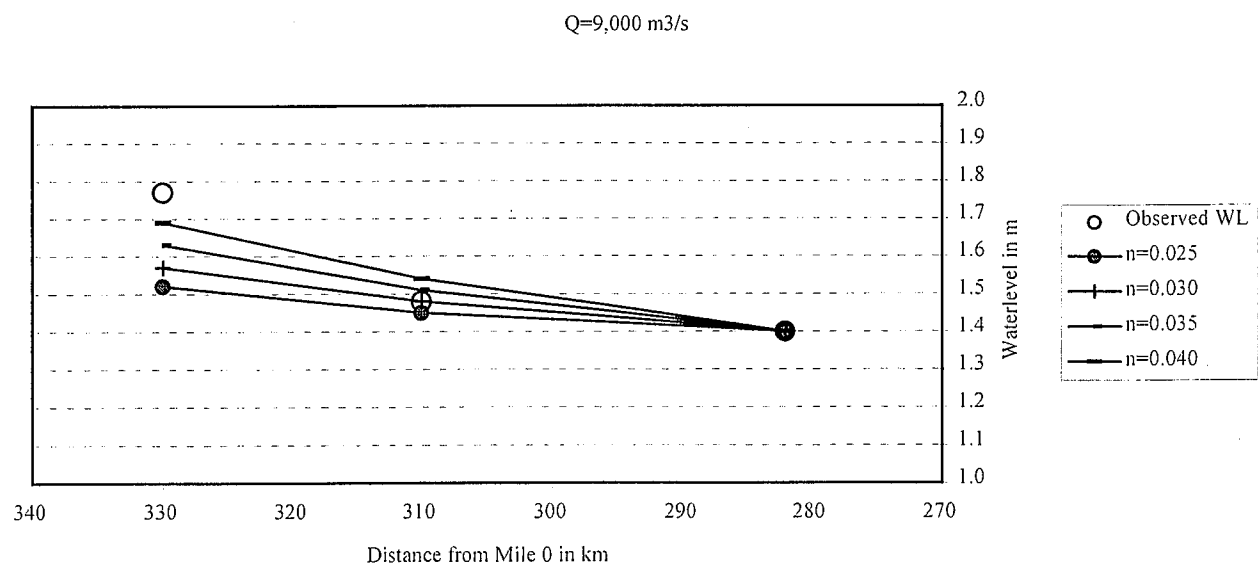
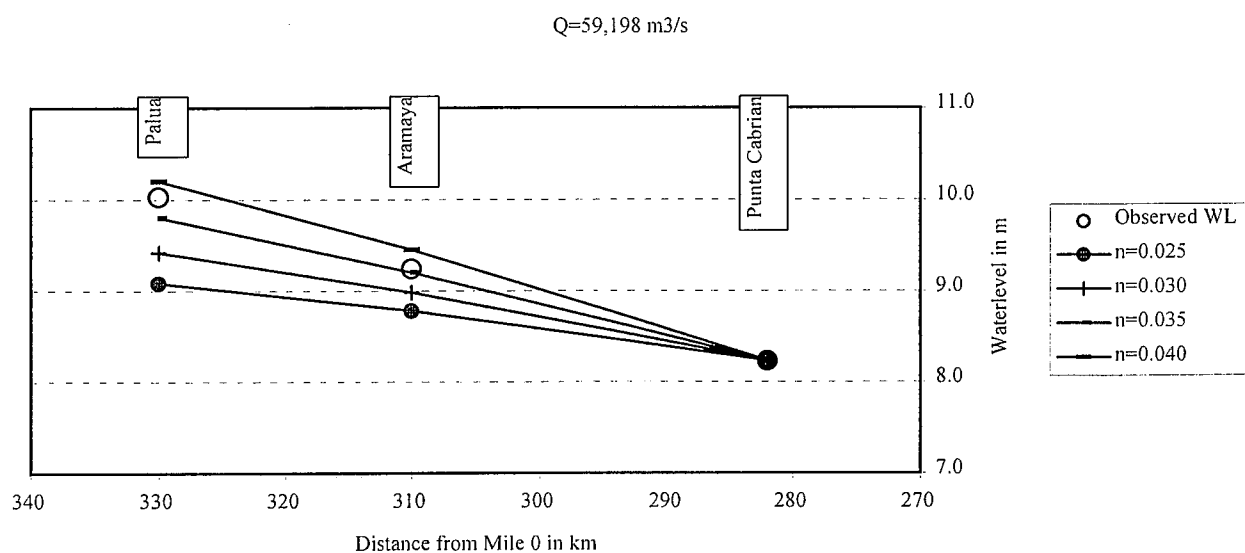
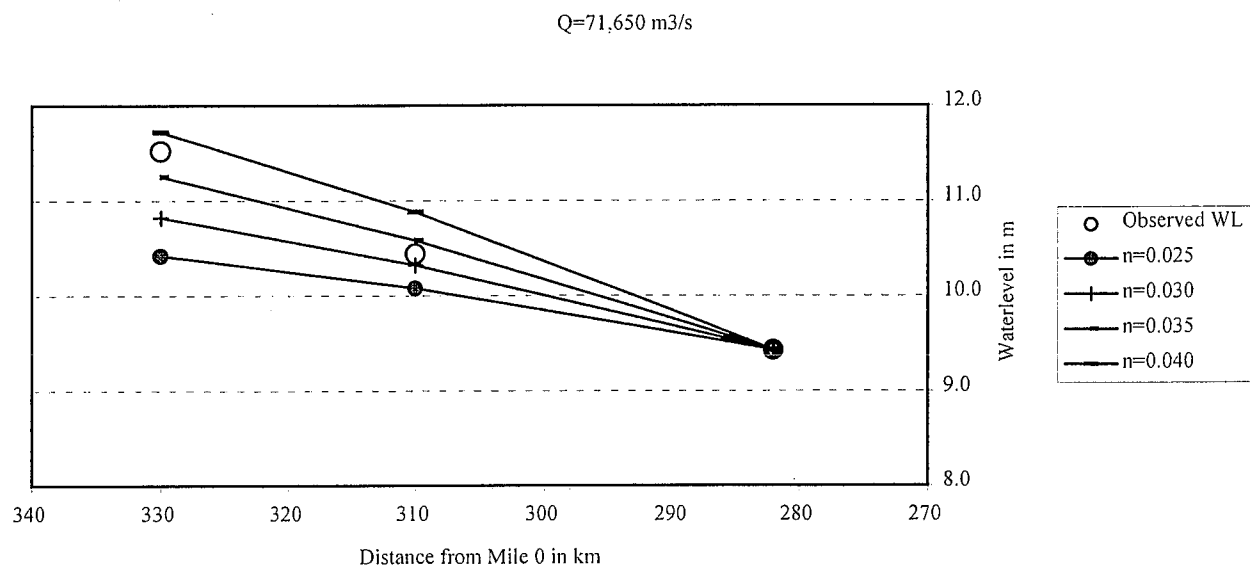
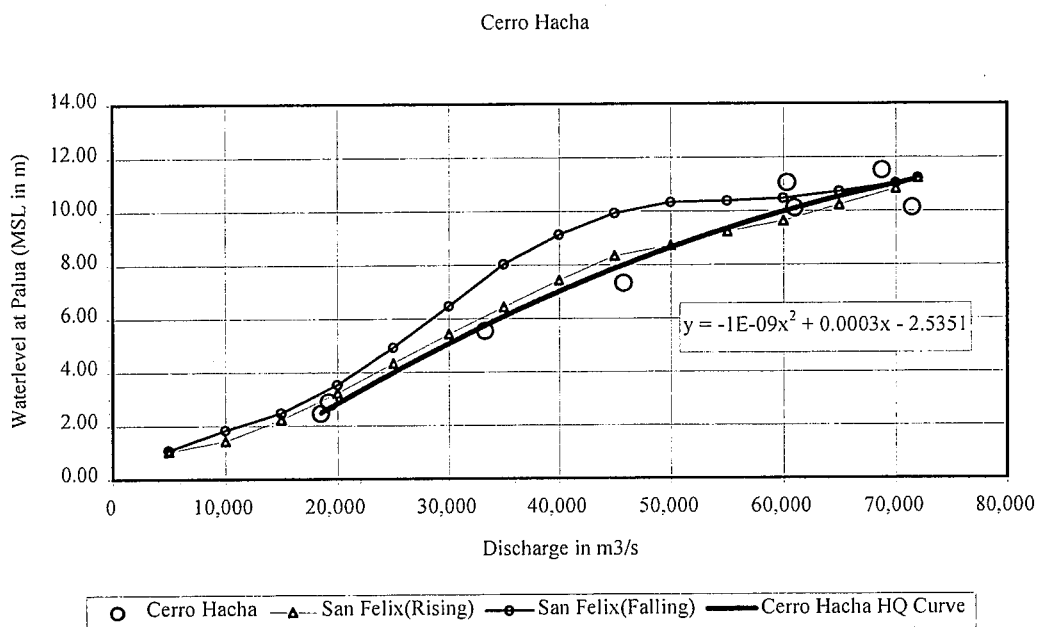


Fig. 6-3-5 Calibración de Aspereza por medio del Cálculo del Nivel del Agua No - Uniforme

Table Measured Discharge at Cerro Hacha Station

Date	Waterlevel	Discharge at Cerro Hacha		
	Palua(MSL)	Rising Period	Falling Period	Cerro Hacha
1993/4/10	2.47	18,530		18,530
1993/9/21	10.13		71,490	71,490
1993/11/28	7.32		45,791	45,791
1994/4/29	2.89	19,250		19,250
1994/8/8	11.06	60,349		60,349
1995/9/9	10.12		61,014	61,014
1996/9/1	11.52		68,792	68,792
1997/6/2	5.55	33,316		33,316



Note:

"San Felix" is the old rating curve at San Felix.

"Cerro Hacha" is the relation curve between Cerro Hacha Discharge and Palua Waterlevel.

Supposing the discharge at Cerro Hacha and the waterlevel at Palua are representing the upstream boundary conditions of the Orinoco River.

Fig. 6-3-6 Curva de Relación Modificada entre nivel de Agua y Descarga

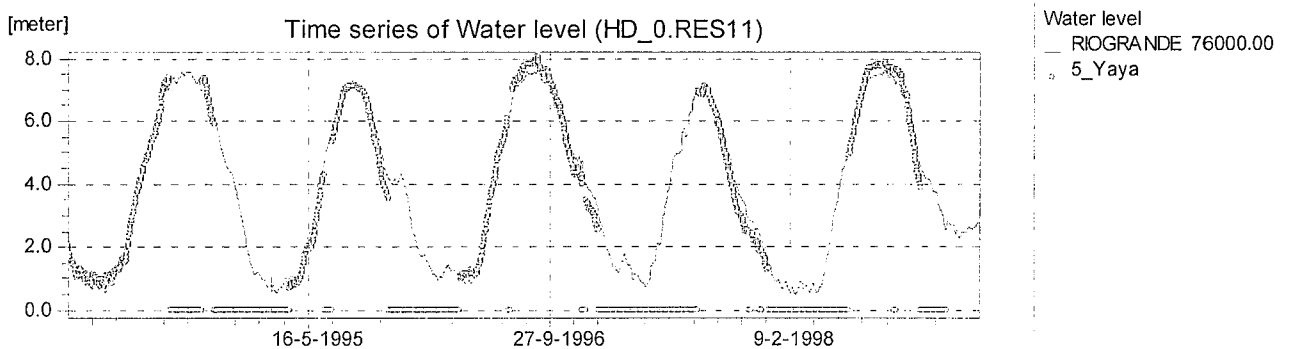
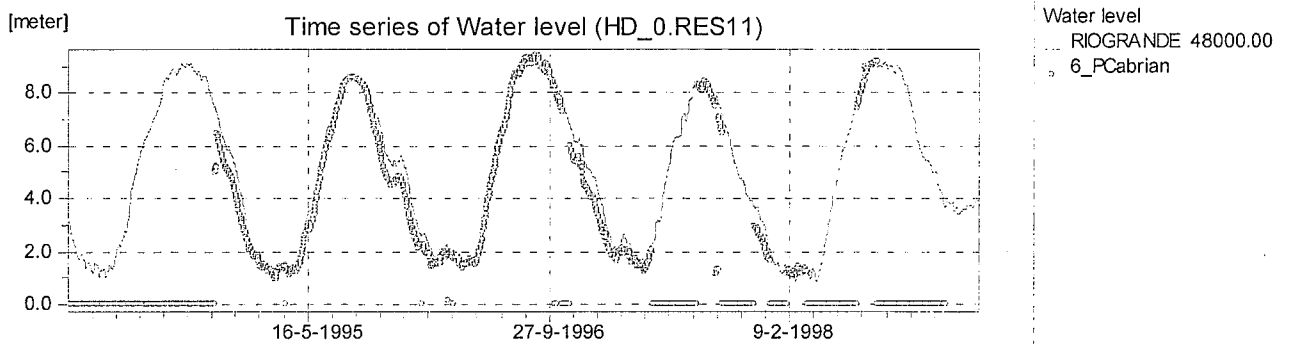
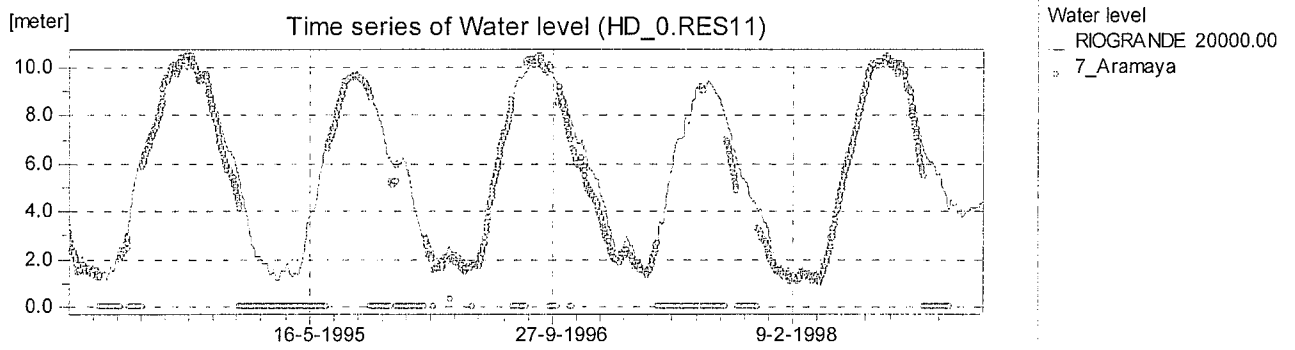
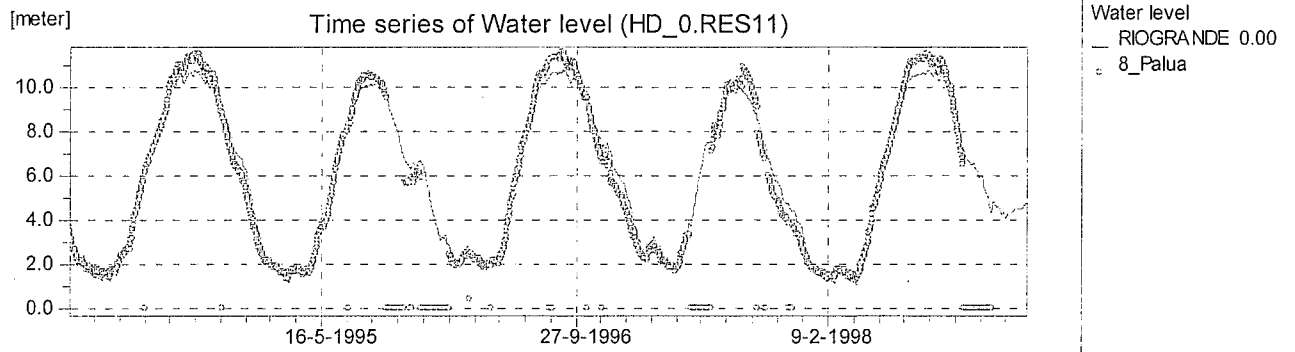
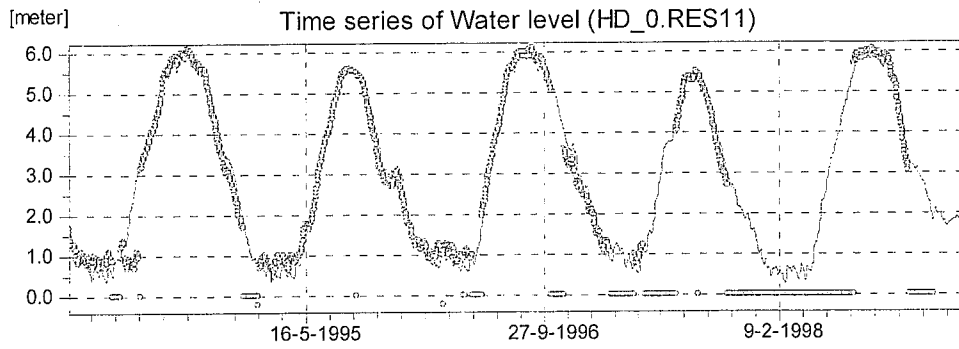
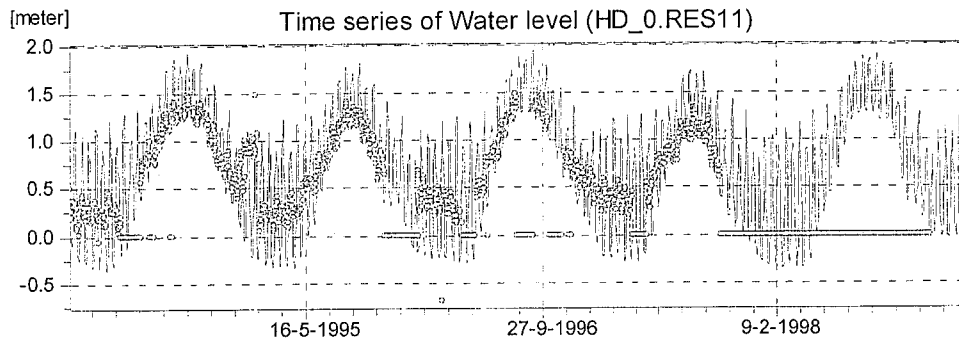


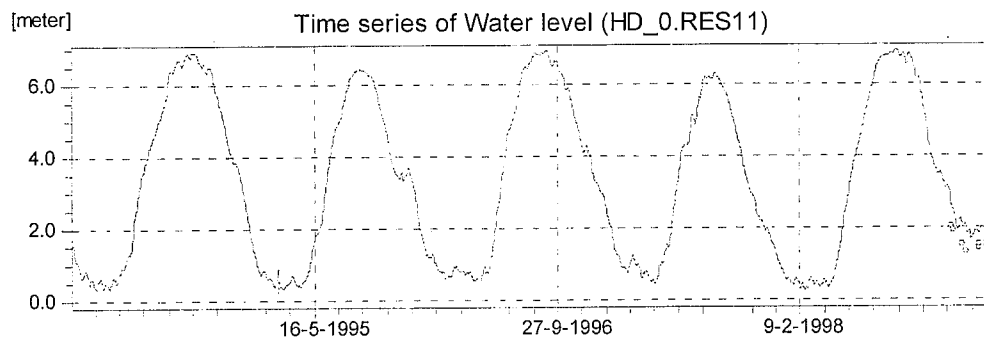
Fig. 6-3-7 Comparación del Nivel de Agua Calculado y Observado (1/2)



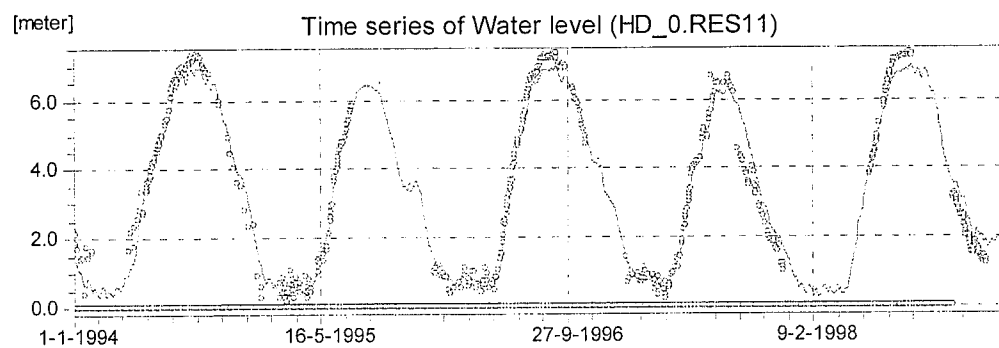
Water level
 _ RIOGRANDE 124000.00
 o 4_Socoroco



Water level
 _ RIOGRANDE 214000.00
 o 3_DPerez



Water level
 _ MACAREO 19374.03
 o Macareo_H



Water level
 _ MANAMO 14700.00
 o Manamo G

Fig. 6-3-7 Comparación del Nivel de Agua Calculado y Observado (2/2)

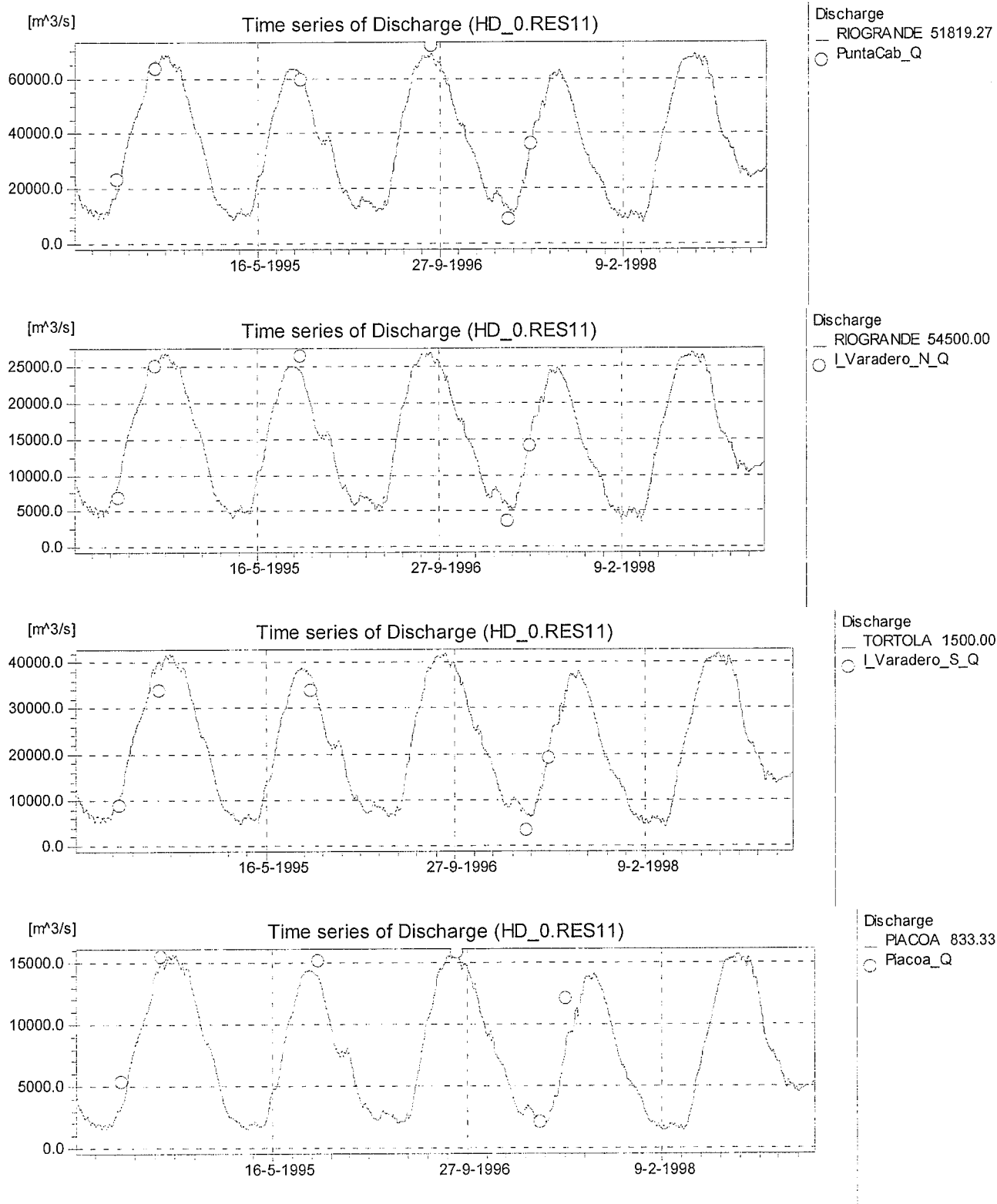


Fig. 6-3-8 Comparación de la Descarga Calculada y Observada (1/2)