

TABLA f1.1
AFLUENTES EMBALSE RALCO - CAUDALES MEDIOS MENSUALES (m3/s)
 CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm)
 $V(OC-MZ)=0.646 \cdot I(MY-SE) + 0.936 \cdot P(OC-MZ) + 47.618$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P)-VD(O)	(<VD(O)>-VD(O)) ²	(VD(P)-VD(O)) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
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1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1655.7	1404.8	-250.9	15.2%	18.2%	274.1	250.9	75104.9	62947.0	
1976/77	1348.6	1341.0	-7.7	0.6%	0.6%	33.0	7.7	1091.4	58.7	
1977/78	1909.7	1386.0	-523.7	27.4%	37.9%	528.0	523.7	278793.4	274244.9	
1978/79	1570.6	1777.5	206.9	13.2%	15.0%	188.9	206.9	35680.6	42804.8	
1979/80	1735.7	1970.1	234.4	13.5%	17.0%	354.0	234.4	125315.6	54958.5	
1980/81	1135.9	1604.0	468.0	41.2%	33.9%	245.7	468.0	60387.9	219032.3	
1981/82	911.2	1161.7	250.5	27.5%	18.1%	470.5	250.5	221360.6	62751.1	
1982/83	2003.1	1888.1	-115.1	5.7%	8.3%	621.4	115.1	386184.4	13237.0	
1983/84	1352.2	987.5	-364.7	27.0%	26.4%	29.5	364.7	869.5	132977.9	
1984/85	2289.9	1556.4	-733.5	32.0%	53.1%	908.2	733.5	824829.4	537955.4	
1985/86	904.7	1109.0	204.3	22.6%	14.8%	477.0	204.3	227484.2	41735.2	
1986/87	1362.9	1573.2	210.3	15.4%	15.2%	18.8	210.3	352.0	44226.2	
1987/88	1239.7	1206.7	-33.0	2.7%	2.4%	142.0	33.0	20166.9	1087.1	
1988/89	1202.1	972.3	-229.7	19.1%	16.6%	179.6	229.7	32263.1	52784.3	
1989/90	1166.3	1460.0	293.6	25.2%	21.3%	215.3	293.6	46372.5	86229.4	
1990/91	784.1	992.4	208.3	26.6%	15.1%	597.5	208.3	357055.2	43373.0	
1991/92	1077.9	1426.4	348.6	32.3%	25.2%	303.8	348.6	92301.3	121490.1	
1992/93	1700.3	1375.7	-324.6	19.1%	23.5%	318.6	324.6	101516.7	105352.6	
1993/94	1702.0	1651.8	-50.3	3.0%	3.6%	320.4	50.3	102626.8	2527.6	
1994/95	1862.3	1515.5	-346.8	18.6%	25.1%	480.6	346.8	230966.1	120267.9	
1995/96	1531.9	1332.8	-199.0	13.0%	14.4%	150.2	199.0	22553.8	39620.9	
1996/97	588.1	730.1	142.0	24.1%	10.3%	793.6	142.0	629748.8	20170.2	
1997/98	1350.1	1455.4	105.3	7.8%	7.6%	31.6	105.3	995.8	11083.4	
1998/99	429.8	498.8	69.0	16.1%	5.0%	951.9	69.0	906120.1	4765.6	
1999/00	1192.5	1318.0	125.5	10.5%	9.1%	189.2	125.5	35786.8	15741.1	
2000/01	1460.9	1550.1	89.1	6.1%	6.5%	79.2	89.1	6280.5	7943.5	
2001/02	991.7	1556.8	565.1	57.0%	40.9%	390.0	565.1	152071.2	319368.3	
2002/03	2227.1	1884.9	-342.1	15.4%	24.8%	845.4	342.1	714661.8	117042.1	
PROM=	1381.7	1381.7	0.0	19.2%	18.2%	SUMA=	10137.9	7041.9	5688941.3	2555776.2

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros = 2		Residuos	
$\beta^*1= 0.65$	$ E \leq 5\%$	3	11%	4	14%	N datos= 28		Promedio=	0.00
$\beta^*2= 0.94$	$5\% < E \leq 10\%$	3	11%	4	14%	E1 = 19%		$\sigma=$	0.23
$\beta^*3=$	$10\% < E \leq 15\%$	4	14%	4	14%	E2 = 18%		$\chi^2_{(0.05)}=$	11.07
$\beta^*4=$	$15\% < E \leq 20\%$	7	25%	6	21%	$E_{STD} = 302.12$		$\chi^2_{(calculado)}=$	3.98
$\beta^*5=$	$20\% < E \leq 30\%$	7	25%	6	21%	$E_{TIP} = 319.7$		CUMPLE DISTRIBUCION NORMAL	
$\beta^*6=$	$30\% < E $	4	14%	4	14%	$R^2 = 0.55$			
Cte= -47.62	TOTAL=	28	100%	28	100%	C.B.= 1.4		P (Res-Yest)=	0.02

TABLA f1.2
AFLUENTES EMBALSE RALCO - CAUDALES MEDIOS MENSUALES (m3/s)
 CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm)
 $V(OC-MZ)=0.75 \cdot P(AB-SE) + 0.941 \cdot P(OC-MZ) + 0.716 \cdot Q(AB-SE) + 287.034$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P)-VD(O)	(<VD(O)>-VD(O)) ²	(VD(P)-VD(O)) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
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1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1655.7	1600.1	-55.7	3.4%	4.0%	274.1	55.7	75104.9	3099.1	
1976/77	1348.6	1436.3	87.7	6.5%	6.3%	33.0	87.7	1091.4	7683.6	
1977/78	1909.7	1343.9	-565.7	29.6%	40.9%	528.0	565.7	278793.4	320066.9	
1978/79	1570.6	1778.9	208.3	13.3%	15.1%	188.9	208.3	35680.6	43388.6	
1979/80	1735.7	1912.0	176.3	10.2%	12.8%	354.0	176.3	125315.6	31074.6	
1980/81	1135.9	1316.7	180.7	15.9%	13.1%	245.7	180.7	60387.9	32665.6	
1981/82	911.2	895.3	-15.9	1.7%	1.2%	470.5	15.9	221360.6	252.8	
1982/83	2003.1	1919.2	-84.0	4.2%	6.1%	621.4	84.0	386184.4	7051.1	
1983/84	1352.2	1175.5	-176.7	13.1%	12.8%	29.5	176.7	869.5	31230.5	
1984/85	2289.9	1777.7	-512.2	22.4%	37.1%	908.2	512.2	824829.4	262386.0	
1985/86	904.7	1022.0	117.3	13.0%	8.5%	477.0	117.3	227484.2	13748.1	
1986/87	1362.9	1559.9	196.9	14.4%	14.3%	18.8	196.9	352.0	38785.8	
1987/88	1239.7	923.8	-315.9	25.5%	22.9%	142.0	315.9	20166.9	99806.3	
1988/89	1202.1	1046.8	-155.3	12.9%	11.2%	179.6	155.3	32263.1	24117.8	
1989/90	1166.3	1475.9	309.6	26.5%	22.4%	215.3	309.6	46372.5	95831.2	
1990/91	784.1	770.4	-13.7	1.8%	1.0%	597.5	13.7	357055.2	188.7	
1991/92	1077.9	1577.4	499.5	46.3%	36.2%	303.8	499.5	92301.3	249494.9	
1992/93	1700.3	1621.7	-78.6	4.6%	5.7%	318.6	78.6	101516.7	6181.0	
1993/94	1702.0	1574.4	-127.7	7.5%	9.2%	320.4	127.7	102626.8	16302.3	
1994/95	1862.3	1406.2	-456.0	24.5%	33.0%	480.6	456.0	230966.1	207968.5	
1995/96	1531.9	1251.5	-280.3	18.3%	20.3%	150.2	280.3	22553.8	78583.5	
1996/97	588.1	792.8	204.7	34.8%	14.8%	793.6	204.7	629748.8	41892.6	
1997/98	1350.1	1467.8	117.7	8.7%	8.5%	31.6	117.7	995.8	13849.7	
1998/99	429.8	569.8	140.0	32.6%	10.1%	951.9	140.0	906120.1	19593.3	
1999/00	1192.5	1520.5	328.0	27.5%	23.7%	189.2	328.0	35786.8	107586.9	
2000/01	1460.9	1663.5	202.5	13.9%	14.7%	79.2	202.5	6280.5	41017.8	
2001/02	991.7	1414.9	423.2	42.7%	30.6%	390.0	423.2	152071.2	179095.1	
2002/03	2227.1	1872.6	-354.4	15.9%	25.7%	845.4	354.4	714661.8	125620.0	
PROM=	1381.7	1381.7	0.0	17.6%	16.5%	SUMA=	10137.9	6384.6	5688941.3	2098562.4

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros = 3		Residuos	
$\beta^*1= 0.75$	$ E \leq 5\%$	5	18%	3	11%	N datos= 28		Promedio=	0.00
$\beta^*2= 0.94$	$5\% < E \leq 10\%$	3	11%	6	21%	$ E1 = 18\%$		$\sigma =$	0.21
$\beta^*3= -0.72$	$0\% < E \leq 15\%$	7	25%	8	29%	$ E2 = 17\%$		$\chi^2_{(0.05)} =$	11.07
$\beta^*4=$	$5\% < E \leq 20\%$	3	11%	1	4%	$E_{STD} = 273.8$		$\chi^2_{(calculado)} =$	5.37
$\beta^*5=$	$20\% < E \leq 30\%$	6	21%	5	18%	$E_{TIP} = 295.7$		CUMPLE DISTRIBUCION NORMAL	
$\beta^*6=$	$30\% < E $	4	14%	5	18%	$R^2 = 0.63$			
Cte= -287.03	TOTAL=	28	100%	28	100%	C.B.= 1.6		P (Res-Yest)=	0.04

TABLA f1.3
AFLUENTES EMBALSE RALCO - CAUDALES MEDIOS MENSUALES (m3/s)

CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm)
 $V(OC-MZ)=0.934 \cdot I(MY-SE) + 0.974 \cdot P(OC-MZ) + 0.211 \cdot Q(AB-SE) + 13.153$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	$ <VD(O)>-VD(O) $	$ VD(P)-VD(O) $	$(<VD(O)>-VD(O))^2$	$(VD(P)-VD(O))^2$	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
1959/60										
1960/61										
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1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1655.7	1446.7	-209.1	12.6%	15.1%	274.1	209.1	75104.9	43704.4	
1976/77	1348.6	1435.7	87.1	6.5%	6.3%	33.0	87.1	1091.4	7578.7	
1977/78	1909.7	1378.2	-531.5	27.8%	38.5%	528.0	531.5	278793.4	282463.5	
1978/79	1570.6	1904.1	333.5	21.2%	24.1%	188.9	333.5	35680.6	111231.1	
1979/80	1735.7	2055.8	320.1	18.4%	23.2%	354.0	320.1	125315.6	102452.2	
1980/81	1135.9	1403.7	267.7	23.6%	19.4%	245.7	267.7	60387.9	71676.6	
1981/82	911.2	977.5	66.3	7.3%	4.8%	470.5	66.3	221360.6	4397.9	
1982/83	2003.1	1959.0	-44.1	2.2%	3.2%	621.4	44.1	386184.4	1946.2	
1983/84	1352.2	1038.2	-314.0	23.2%	22.7%	29.5	314.0	869.5	98566.4	
1984/85	2289.9	1621.9	-668.0	29.2%	48.3%	908.2	668.0	824829.4	446261.2	
1985/86	904.7	1035.2	130.5	14.4%	9.4%	477.0	130.5	227484.2	17024.8	
1986/87	1362.9	1466.8	103.8	7.6%	7.5%	18.8	103.8	352.0	10783.2	
1987/88	1239.7	1219.2	-20.5	1.7%	1.5%	142.0	20.5	20166.9	418.6	
1988/89	1202.1	1044.1	-157.9	13.1%	11.4%	179.6	157.9	32263.1	24946.8	
1989/90	1166.3	1553.4	387.0	33.2%	28.0%	215.3	387.0	46372.5	149780.2	
1990/91	784.1	965.0	180.8	23.1%	13.1%	597.5	180.8	357055.2	32694.3	
1991/92	1077.9	1367.5	289.7	26.9%	21.0%	303.8	289.7	92301.3	83909.2	
1992/93	1700.3	1297.2	-403.1	23.7%	29.2%	318.6	403.1	101516.7	162466.7	
1993/94	1702.0	1504.4	-197.6	11.6%	14.3%	320.4	197.6	102626.8	39057.9	
1994/95	1862.3	1519.2	-343.1	18.4%	24.8%	480.6	343.1	230966.1	117704.2	
1995/96	1531.9	1326.0	-205.9	13.4%	14.9%	150.2	205.9	22553.8	42378.9	
1996/97	588.1	753.6	165.5	28.1%	12.0%	793.6	165.5	629748.8	27377.5	
1997/98	1350.1	1342.1	-8.1	0.6%	0.6%	31.6	8.1	995.8	64.9	
1998/99	429.8	568.0	138.2	32.2%	10.0%	951.9	138.2	906120.1	19102.7	
1999/00	1192.5	1443.9	251.4	21.1%	18.2%	189.2	251.4	35786.8	63218.3	
2000/01	1460.9	1655.0	194.1	13.3%	14.0%	79.2	194.1	6280.5	37658.5	
2001/02	991.7	1474.0	482.3	48.6%	34.9%	390.0	482.3	152071.2	232592.6	
2002/03	2227.1	1931.8	-295.2	13.3%	21.4%	845.4	295.2	714661.8	87158.0	
PROM=	1381.7	1381.7	0.0	18.4%	17.6%	SUMA=	10137.9	6795.9	5688941.3	2318615.6

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros = 3		Residuos	
$\beta^*1= 0.93$	$ E \leq 5\%$	3	11%	4	14%	N datos= 28		Promedio=	0.00
$\beta^*2= 0.97$	$5\% < E \leq 10\%$	3	11%	3	11%	$ E1 = 18\%$		$\sigma =$	0.21
$\beta^*3= -0.21$	$0\% < E \leq 15\%$	7	25%	7	25%	$ E2 = 18\%$		$\chi^2_{(0.05)} =$	11.07
$\beta^*4=$	$5\% < E \leq 20\%$	2	7%	3	11%	$E_{STD} = 287.8$		$\chi^2_{(calculado)} =$	2.82
$\beta^*5=$	$20\% < E \leq 30\%$	10	36%	8	29%	$E_{TIP} = 310.8$		CUMPLE DISTRIBUCION NORMAL	
$\beta^*6=$	$30\% < E $	3	11%	3	11%	$R^2 = 0.59$			
Cte= -13.15	TOTAL=	28	100%	28	100%	C.B.= 1.5		P (Res-Yest)=	0.02

TABLA f1.4
AFLUENTES EMBALSE RALCO - CAUDALES MEDIOS MENSUALES (m3/s)
CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm) - RUTA DE NIEVE MESETA ALTO LOS MALLINES
 $V(OC-MZ)=0.268 \cdot I(MY-SE) + 0.68 \cdot P(OC-MZ) + 0.104 \cdot P(a-1) + 0.782 \cdot RN(AM) + 423.988$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P)-VD(O)	(<VD(O)>-VD(O)) ²	(VD(P)-VD(O)) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
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1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1655.7	1779.4	123.7	7.5%	8.7%	238.8	123.7	57024.0	15296.6	
1976/77	1348.6	1133.0	-215.7	16.0%	15.2%	68.3	215.7	4663.9	46508.8	
1977/78	1909.7	1736.3	-173.3	9.1%	12.2%	492.8	173.3	242805.7	30048.2	
1978/79	1570.6	1567.9	-2.7	0.2%	0.2%	153.6	2.7	23604.4	7.2	
1979/80	1735.7	1731.1	-4.6	0.3%	0.3%	318.7	4.6	101597.6	21.2	
1980/81	1135.9	1506.2	370.3	32.6%	26.1%	281.0	370.3	78958.2	137115.5	
1981/82	911.2	1077.3	166.1	18.2%	11.7%	505.7	166.1	255778.4	27597.8	
1982/83	2003.1	2099.0	95.9	4.8%	6.8%	586.2	95.9	343608.9	9200.6	
1983/84	1352.2	1267.3	-84.9	6.3%	6.0%	64.7	84.9	4191.7	7200.0	
1984/85	2289.9	1912.0	-377.9	16.5%	26.7%	872.9	377.9	762033.9	142801.2	
1985/86	904.7	903.8	-0.9	0.1%	0.1%	512.2	0.9	262357.8	0.8	
1986/87	1362.9	1344.1	-18.8	1.4%	1.3%	54.0	18.8	2918.0	353.4	
1987/88	1239.7	1341.4	101.7	8.2%	7.2%	177.3	101.7	31423.2	10344.9	
1988/89	1202.1	1218.0	15.9	1.3%	1.1%	214.9	15.9	46171.3	252.7	
1989/90	1166.3	1421.6	255.3	21.9%	18.0%	250.6	255.3	62799.6	65164.0	
1990/91	784.1	517.4	-266.8	34.0%	18.8%	632.8	266.8	400431.6	71176.1	
1991/92	1077.9	1163.0	85.1	7.9%	6.0%	339.1	85.1	114966.4	7248.7	
1992/93	1700.3	1642.4	-57.9	3.4%	4.1%	283.4	57.9	80293.5	3355.0	
1993/94	1702.0	1536.4	-165.6	9.7%	11.7%	285.1	165.6	81281.2	27427.0	
1994/95	1862.3	1545.4	-316.9	17.0%	22.4%	445.3	316.9	198322.0	100394.8	
1995/96	1531.9	1633.6	101.7	6.6%	7.2%	114.9	101.7	13207.4	10349.1	
1996/97	588.1	706.8	118.6	20.2%	8.4%	828.8	118.6	686947.3	14076.2	
1997/98	1350.1	1086.5	-263.6	19.5%	18.6%	66.8	263.6	4463.9	69501.7	
1998/99										
1999/00	1192.5	1271.7	79.2	6.6%	5.6%	224.4	79.2	50368.7	6270.9	
2000/01	1460.9	1633.6	172.7	11.8%	12.2%	44.0	172.7	1935.5	29826.9	
2001/02	991.7	1409.0	417.2	42.1%	29.4%	425.2	417.2	180811.0	174085.1	
2002/03	2227.1	2073.1	-154.0	6.9%	10.9%	810.1	154.0	656296.1	23713.4	
PROM=	1416.9	1416.9	0.0	12.2%	11.0%	SUMA=	9291.8	4207.1	4749261.2	1029337.6

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros = 4		Residuos	
β*1= 0.27	E <=5%	7	26%	6	22%	N datos= 27		Promedio=	0.00
β*2= 0.68	5%<= E <=10%	9	33%	8	30%	E1 = 12%		σ=	0.16
β*3= 0.10	0%<= E <=15%	1	4%	5	19%	E2 = 11%		χ ² _(0.05) =	11.07
β*4= 0.78	5%<= E <=20%	5	19%	4	15%	E _{STD} = 195.3		χ ² _(calculado) =	3.71
β*5=	20%<= E <=30%	2	7%	4	15%	E _{TIP} = 216.3		CUMPLE DISTRIBUCION NORMAL	
β*6=	30%<= E	3	11%	0	0%	R ² = 0.78			
Cte= -423.99	TOTAL=	27	100%	27	100%	C.B.= 2.2		P (Res-Yest)=	0.03

TABLA f1.5
AFLUENTES EMBALSE RALCO - CAUDALES MEDIOS MENSUALES (m3/s)
CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm) - RUTA DE NIEVE MESETA ALTO LOS MALLINES
 $V(OC-MZ)=0.344 \cdot I(MY-SE) + 0.743 \cdot P(OC-MZ) + -0.034 \cdot Q(AB-SE) + 0.711 \cdot RN(AM) + 57.032$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	$ <VD(O)>-VD(O) $	$ VD(P)_i-VD(O)_i $	$(<VD(O)>-VD(O))^2$	$(VD(P)_i-VD(O))^2$	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
1959/60										
1960/61										
1961/62										
1962/63										
1963/64										
1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1655.7	1817.5	161.8	9.8%	11.4%	238.8	161.8	57024.0	26176.3	
1976/77	1348.6	1162.8	-185.8	13.8%	13.1%	68.3	185.8	4663.9	34536.4	
1977/78	1909.7	1739.6	-170.1	8.9%	12.0%	492.8	170.1	242805.7	28942.9	
1978/79	1570.6	1588.1	17.5	1.1%	1.2%	153.6	17.5	23604.4	307.8	
1979/80	1735.7	1725.9	-9.8	0.6%	0.7%	318.7	9.8	101597.6	96.7	
1980/81	1135.9	1450.1	314.1	27.7%	22.2%	281.0	314.1	78958.2	98675.1	
1981/82	911.2	969.3	58.1	6.4%	4.1%	505.7	58.1	255778.4	3370.6	
1982/83	2003.1	2083.4	80.2	4.0%	5.7%	586.2	80.2	343608.9	6437.1	
1983/84	1352.2	1134.2	-218.0	16.1%	15.4%	64.7	218.0	4191.7	47527.1	
1984/85	2289.9	1962.1	-327.8	14.3%	23.1%	872.9	327.8	762033.9	107446.4	
1985/86	904.7	877.3	-27.4	3.0%	1.9%	512.2	27.4	262357.8	753.2	
1986/87	1362.9	1399.4	36.5	2.7%	2.6%	54.0	36.5	2918.0	1329.4	
1987/88	1239.7	1267.0	27.3	2.2%	1.9%	177.3	27.3	31423.2	746.0	
1988/89	1202.1	1266.1	64.0	5.3%	4.5%	214.9	64.0	46171.3	4102.3	
1989/90	1166.3	1546.9	380.5	32.6%	26.9%	250.6	380.5	62799.6	144793.3	
1990/91	784.1	595.4	-188.7	24.1%	13.3%	632.8	188.7	400431.6	35615.2	
1991/92	1077.9	1240.7	162.8	15.1%	11.5%	339.1	162.8	114966.4	26520.1	
1992/93	1700.3	1552.4	-147.9	8.7%	10.4%	283.4	147.9	80293.5	21877.9	
1993/94	1702.0	1466.0	-236.0	13.9%	16.7%	285.1	236.0	81281.2	55703.6	
1994/95	1862.3	1403.7	-458.6	24.6%	32.4%	445.3	458.6	198322.0	210291.6	
1995/96	1531.9	1574.7	42.9	2.8%	3.0%	114.9	42.9	13207.4	1837.0	
1996/97	588.1	685.5	97.4	16.6%	6.9%	828.8	97.4	686947.3	9477.2	
1997/98	1350.1	1239.5	-110.6	8.2%	7.8%	66.8	110.6	4463.9	12242.2	
1998/99										
1999/00	1192.5	1482.7	290.2	24.3%	20.5%	224.4	290.2	50368.7	84195.6	
2000/01	1460.9	1658.6	197.7	13.5%	14.0%	44.0	197.7	1935.5	39086.3	
2001/02	991.7	1370.9	379.2	38.2%	26.8%	425.2	379.2	180811.0	143788.2	
2002/03	2227.1	1997.8	-229.3	10.3%	16.2%	810.1	229.3	656296.1	52579.8	
PROM=	1416.9	1416.9	0.0	12.9%	12.1%	SUMA=	9291.8	4620.4	4749261.2	1198455.2

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros =	4	Residuos	
β*1= 0.34	E <=5%	7	26%	8	30%	N datos=	27	Promedio=	0.00
β*2= 0.74	5%<= E <=10%	6	22%	3	11%	E1 =	13%	σ=	0.16
β*3= -0.03	0%<= E <=15%	5	19%	7	26%	E2 =	12%	χ ² _(0.05) =	11.07
β*4= 0.71	5%<= E <=20%	3	11%	3	11%	E _{STD} =	210.7	χ ² (calculado)=	4.90
β*5=	20%<= E <=30%	4	15%	5	19%	E _{TIP} =	233.4	CUMPLE DISTRIBUCION NORMAL	
β*6=	30%<= E	2	7%	1	4%	R ² =	0.75		
Cte= -57.03	TOTAL=	27	100%	27	100%	C.B.=	2.0	ρ (Res-Yest)=	0.05

TABLA f2.1
CUENCA INTERMEDIA ENTRE RALCO Y PANGUE (R.N.) - CAUDALES MEDIOS MENSUALES (m3/s)
 CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm)
 $V(OC-MZ)=0.063 \cdot P(OC-MZ) + 0.082 \cdot Q(AB-SE) + 44.726$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P) _i -VD(O)	(<VD(O)>-VD(O)) ²	(VD(P) _i -VD(O)) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
1959/60										
1960/61										
1961/62										
1962/63										
1963/64										
1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	209.2	115.7	-93.5	44.7%	81.0%	93.7	93.5	8787.8	8741.2	
1976/77	99.7	102.2	2.5	2.5%	2.2%	15.7	2.5	248.0	6.4	
1977/78	107.7	99.9	-7.7	7.2%	6.7%	7.7	7.7	59.7	60.0	
1978/79	78.8	113.9	35.1	44.5%	30.4%	36.6	35.1	1341.8	1231.0	
1979/80	101.7	140.6	38.9	38.2%	33.7%	13.7	38.9	186.9	1513.8	
1980/81	83.3	142.1	58.8	70.6%	51.0%	32.1	58.8	1028.7	3458.5	
1981/82	102.2	102.8	0.6	0.6%	0.5%	13.2	0.6	174.4	0.4	
1982/83	123.4	131.2	7.7	6.3%	6.7%	8.0	7.7	64.4	59.5	
1983/84	71.7	84.5	12.8	17.8%	11.1%	43.7	12.8	1907.8	163.4	
1984/85	124.4	115.6	-8.8	7.0%	7.6%	9.0	8.8	80.5	76.8	
1985/86	63.0	97.2	34.2	54.3%	29.6%	52.4	34.2	2749.8	1170.5	
1986/87	85.1	127.2	42.1	49.5%	36.5%	30.3	42.1	920.8	1772.0	
1987/88	89.4	104.1	14.7	16.5%	12.7%	26.1	14.7	679.1	216.4	
1988/89	86.5	88.0	1.5	1.7%	1.3%	28.9	1.5	836.0	2.2	
1989/90	153.2	124.3	-28.9	18.9%	25.0%	37.8	28.9	1426.2	833.9	
1990/91	111.6	91.2	-20.4	18.3%	17.7%	3.8	20.4	14.2	417.5	
1991/92	103.9	118.7	14.7	14.2%	12.8%	11.5	14.7	131.4	217.2	
1992/93	135.3	118.1	-17.1	12.7%	14.8%	19.9	17.1	394.6	293.5	
1993/94	92.2	116.6	24.4	26.4%	21.1%	23.2	24.4	539.0	593.6	
1994/95	91.4	112.1	20.7	22.6%	17.9%	24.0	20.7	574.2	427.9	
1995/96	79.5	97.8	18.3	23.0%	15.9%	35.9	18.3	1289.3	335.2	
1996/97	56.1	80.0	24.0	42.8%	20.8%	59.3	24.0	3522.3	575.1	
1997/98	125.4	124.1	-1.3	1.0%	1.1%	10.0	1.3	99.5	1.7	
1998/99	76.6	64.3	-12.4	16.2%	10.7%	38.8	12.4	1502.6	153.4	
1999/00	162.7	105.8	-57.0	35.0%	49.4%	47.3	57.0	2239.7	3244.1	
2000/01	222.4	231.8	9.3	4.2%	8.1%	107.0	9.3	11455.4	87.0	
2001/02	170.5	130.8	-39.6	23.3%	34.3%	55.0	39.6	3029.9	1571.4	
2002/03	224.6	151.0	-73.6	32.8%	63.8%	109.2	73.6	11918.8	5416.7	
PROM=	115.4	115.4	0.0	23.3%	22.3%	SUMA=	993.8	720.7	57202.8	32640.2

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros =	Residuos		
β*1= 0.06	E <=5%	5	18%	4	14%	N datos=	28	Promedio=	0.00
β*2= 0.08	5%<= E <=10%	3	11%	4	14%	E1 =	23%	σ=	0.29
β*3=	0%<= E <=15%	2	7%	5	18%	E2 =	22%	χ ² _(0,05) =	11.07
β*4=	5%<= E <=20%	5	18%	3	11%	E _{STD} =	34.1	χ ² (calculado)=	6.77
β*5=	20%<= E <=30%	4	14%	4	14%	E _{TIP} =	36.1	CUMPLE DISTRIBUCION NORMAL	
β*6=	30%<= E	9	32%	8	29%	R ² =	0.43		
Cte= 44.73	TOTAL=	28	100%	28	100%	C.B.=	1.4	P (Res-Yest)=	0.20

TABLA f2.2
CUENCA INTERMEDIA ENTRE RALCO Y PANGUE (R.N.) - CAUDALES MEDIOS MENSUALES (m3/s)
 CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm) - RUTA DE NIEVE MESETA ALTO LOS MALLINES
 $V(OC-MZ)=0.052*P(OC-MZ) +0.076*Q(AB-SE) +0.043*RN(AM) +19.862$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P)-VD(O)	(<VD(O)>-VD(O)) ²	(VD(P)-VD(O)) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
1959/60										
1960/61										
1961/62										
1962/63										
1963/64										
1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	209.2	138.2	-70.9	33.9%	60.7%	92.3	70.9	8520.7	5029.2	
1976/77	99.7	88.2	-11.5	11.5%	9.8%	17.2	11.5	295.2	131.3	
1977/78	107.7	123.8	16.1	14.9%	13.8%	9.2	16.1	83.9	259.0	
1978/79	78.8	110.7	31.9	40.5%	27.3%	38.1	31.9	1449.1	1019.1	
1979/80	101.7	126.9	25.1	24.7%	21.5%	15.1	25.1	228.3	632.1	
1980/81	83.3	133.1	49.8	59.7%	42.6%	33.5	49.8	1122.8	2475.8	
1981/82	102.2	89.3	-12.9	12.6%	11.0%	14.6	12.9	214.3	166.0	
1982/83	123.4	152.6	29.2	23.6%	25.0%	6.6	29.2	43.4	851.0	
1983/84	71.7	87.7	16.0	22.3%	13.7%	45.1	16.0	2035.3	254.8	
1984/85	124.4	140.5	16.1	12.9%	13.8%	7.5	16.1	56.8	258.3	
1985/86	63.0	77.2	14.3	22.7%	12.2%	53.9	14.3	2902.4	203.8	
1986/87	85.1	115.2	30.2	35.4%	25.8%	31.8	30.2	1010.0	909.2	
1987/88	89.4	104.8	15.4	17.3%	13.2%	27.5	15.4	755.9	238.6	
1988/89	86.5	98.9	12.4	14.3%	10.6%	30.3	12.4	921.1	153.1	
1989/90	153.2	123.6	-29.6	19.3%	25.3%	36.3	29.6	1319.8	875.4	
1990/91	111.6	64.6	-47.1	42.2%	40.3%	5.2	47.1	27.1	2214.8	
1991/92	103.9	106.9	2.9	2.8%	2.5%	12.9	2.9	166.4	8.5	
1992/93	135.3	126.5	-8.8	6.5%	7.5%	18.4	8.8	339.7	76.6	
1993/94	92.2	113.8	21.6	23.5%	18.5%	24.7	21.6	607.8	468.5	
1994/95	91.4	107.4	16.0	17.5%	13.7%	25.4	16.0	645.0	255.8	
1995/96	79.5	115.9	36.4	45.8%	31.1%	37.3	36.4	1394.4	1324.4	
1996/97	56.1	65.6	9.6	17.0%	8.2%	60.8	9.6	3694.8	91.3	
1997/98	125.4	112.5	-12.9	10.3%	11.0%	8.5	12.9	72.9	166.3	
1998/99										
1999/00	162.7	115.3	-47.4	29.1%	40.6%	45.9	47.4	2105.9	2249.8	
2000/01	222.4	234.6	12.2	5.5%	10.4%	105.6	12.2	11150.1	149.0	
2001/02	170.5	124.6	-45.9	26.9%	39.3%	53.6	45.9	2873.9	2106.7	
2002/03	224.6	156.4	-68.2	30.4%	58.3%	107.7	68.2	11607.4	4648.4	
PROM=	116.8	116.8	0.0	23.1%	22.5%	SUMA=	965.1	710.1	55644.5	27216.9

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros =	3	Residuos	
$\beta^*1= 0.05$	$ E \leq 5\%$	1	4%	1	4%	N datos=	27	Promedio=	0.00
$\beta^*2= 0.08$	$5\% < E \leq 10\%$	2	7%	3	11%	E1 =	23%	$\sigma=$	0.27
$\beta^*3= 0.04$	$0\% < E \leq 15\%$	6	22%	10	37%	E2 =	23%	$\chi^2_{(0,05)}=$	11.07
$\beta^*4=$	$5\% < E \leq 20\%$	4	15%	1	4%	E _{STD} =	31.7	$\chi^2_{(calculado)}=$	10.53
$\beta^*5=$	$20\% < E \leq 30\%$	7	26%	5	19%	E _{TIP} =	34.4	CUMPLE DISTRIBUCION NORMAL	
$\beta^*6=$	$30\% < E $	7	26%	7	26%	R ² =	0.51		
Cte= 19.86	TOTAL=	27	100%	27	100%	C.B.=	1.4	P (Res-Yest)=	0.15

TABLA X.X.11
CUENCA INTERMEDIA ENTRE RALCO Y PANGUE (R.N.) - CAUDALES MEDIOS MENSUALES (m3/s)
 CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm) - RUTA DE NIEVE MESETA ALTO LOS MALLINES
 $V(OC-MZ)=0.01 \cdot RN(AM) + 1.73 \cdot \max(OC-MZ) + 38.659$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P) _i -VD(O) _i	<VD(O)>-VD(O) _i ²	(VD(P) _i -VD(O) _i) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
1959/60										
1960/61										
1961/62										
1962/63										
1963/64										
1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	209.2	161.0	-48.1	23.0%	41.2%	92.3	48.1	8520.7	2318.4	
1976/77	99.7	121.1	21.4	21.5%	18.3%	17.2	21.4	295.2	458.7	
1977/78	107.7	114.9	7.2	6.7%	6.1%	9.2	7.2	83.9	51.4	
1978/79	78.8	92.3	13.5	17.1%	11.5%	38.1	13.5	1449.1	181.7	
1979/80	101.7	103.3	1.6	1.6%	1.4%	15.1	1.6	228.3	2.5	
1980/81	83.3	83.7	0.4	0.5%	0.3%	33.5	0.4	1122.8	0.1	
1981/82	102.2	102.1	-0.1	0.1%	0.1%	14.6	0.1	214.3	0.0	
1982/83	123.4	138.1	14.7	11.9%	12.6%	6.6	14.7	43.4	215.4	
1983/84	71.7	74.7	3.0	4.1%	2.5%	45.1	3.0	2035.3	8.8	
1984/85	124.4	122.9	-1.5	1.2%	1.3%	7.5	1.5	56.8	2.3	
1985/86	63.0	62.3	-0.7	1.1%	0.6%	53.9	0.7	2902.4	0.5	
1986/87	85.1	74.3	-10.8	12.7%	9.3%	31.8	10.8	1010.0	116.8	
1987/88	89.4	120.1	30.8	34.5%	26.3%	27.5	30.8	755.9	947.6	
1988/89	86.5	86.4	-0.1	0.2%	0.1%	30.3	0.1	921.1	0.0	
1989/90	153.2	120.8	-32.4	21.1%	27.7%	36.3	32.4	1319.8	1049.0	
1990/91	111.6	91.0	-20.6	18.4%	17.6%	5.2	20.6	27.1	424.0	
1991/92	103.9	91.0	-12.9	12.4%	11.1%	12.9	12.9	166.4	166.7	
1992/93	135.3	126.9	-8.4	6.2%	7.2%	18.4	8.4	339.7	69.9	
1993/94	92.2	99.6	7.5	8.1%	6.4%	24.7	7.5	607.8	55.5	
1994/95	91.4	108.9	17.5	19.1%	15.0%	25.4	17.5	645.0	305.9	
1995/96	79.5	95.3	15.8	19.9%	13.6%	37.3	15.8	1394.4	251.0	
1996/97	56.1	69.9	13.8	24.7%	11.8%	60.8	13.8	3694.8	191.5	
1997/98	125.4	120.6	-4.8	3.9%	4.1%	8.5	4.8	72.9	23.3	
1998/99										
1999/00	162.7	176.5	13.7	8.4%	11.7%	45.9	13.7	2105.9	188.3	
2000/01	222.4	197.7	-24.8	11.1%	21.2%	105.6	24.8	11150.1	613.6	
2001/02	170.5	144.8	-25.7	15.1%	22.0%	53.6	25.7	2873.9	658.1	
2002/03	224.6	254.7	30.1	13.4%	25.8%	107.7	30.1	11607.4	908.5	
PROM=	116.8	116.8	0.0	11.8%	12.1%	SUMA=	965.1	381.9	55644.5	9209.7

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	$ E1 _i$		$ E2 _i$		INDICADORES			
		FREC	%	FREC	%	N parámetros =	2	Residuos	
$\beta^*1= 0.01$	$ E \leq 5\%$	8	30%	8	30%	N datos=	27	Promedio=	0.00
$\beta^*2= 1.73$	$5\% < E \leq 10\%$	4	15%	4	15%	$ E1 =$	12%	$\sigma =$	0.15
$\beta^*3=$	$0\% < E \leq 15\%$	5	19%	7	26%	$ E2 =$	12%	$\chi^2_{(0,05)} =$	11.07
$\beta^*4=$	$5\% < E \leq 20\%$	5	19%	2	7%	$E_{STD} =$	18.5	$\chi^2_{(calculado)} =$	3.13
$\beta^*5=$	$20\% < E \leq 30\%$	4	15%	5	19%	$E_{TIP} =$	19.6	CUMPLE DISTRIBUCION NORMAL	
$\beta^*6=$	$30\% < E $	1	4%	1	4%	$R^2 =$	0.83		
Cte= 38.66	TOTAL=	27	100%	27	100%	C.B.=	2.5	P (Res-Yest)=	-0.11

TABLA f3.1
AFLUENTES CENTRAL PANGUE - CAUDALES MEDIOS MENSUALES (m3/s)
 CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm)
 $V(OC-MZ)=0.638 \cdot I(MY-SE) + 0.968 \cdot P(OC-MZ) + 6.48$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P)-VD(O)	(<VD(O)>-VD(O)) ²	(VD(P)-VD(O)) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
1959/60										
1960/61										
1961/62										
1962/63										
1963/64										
1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1808.6	1483.8	-324.8	18.0%	22.2%	347.6	324.8	120817.5	105513.7	
1976/77	1403.4	1423.1	19.7	1.4%	1.3%	57.7	19.7	3326.0	388.6	
1977/78	1992.0	1460.1	-532.0	26.7%	36.4%	531.0	532.0	281948.3	282980.7	
1978/79	1627.3	1853.5	226.2	13.9%	15.5%	166.3	226.2	27651.8	51144.5	
1979/80	1821.5	2069.3	247.7	13.6%	17.0%	360.5	247.7	129963.8	61375.9	
1980/81	1197.2	1694.1	497.0	41.5%	34.0%	263.9	497.0	69628.2	246993.1	
1981/82	979.4	1234.5	255.2	26.1%	17.5%	481.7	255.2	232010.4	65119.8	
1982/83	2076.9	1977.0	-99.9	4.8%	6.8%	615.9	99.9	379355.2	9981.4	
1983/84	1408.2	1056.2	-352.1	25.0%	24.1%	52.8	352.1	2786.6	123962.7	
1984/85	2373.8	1637.6	-736.1	31.0%	50.4%	912.8	736.1	833113.9	541902.7	
1985/86	956.8	1180.7	223.8	23.4%	15.3%	504.2	223.8	254216.5	50101.2	
1986/87	1430.8	1665.8	235.0	16.4%	16.1%	30.2	235.0	912.1	55232.3	
1987/88	1286.5	1279.3	-7.2	0.6%	0.5%	174.5	7.2	30462.5	52.1	
1988/89	1275.4	1043.2	-232.1	18.2%	15.9%	185.7	232.1	34472.9	53877.6	
1989/90	1293.7	1547.7	254.0	19.6%	17.4%	167.4	254.0	28014.6	64526.3	
1990/91	866.0	1058.1	192.1	22.2%	13.1%	595.0	192.1	354026.5	36909.7	
1991/92	1154.7	1504.3	349.6	30.3%	23.9%	306.3	349.6	93834.4	122238.0	
1992/93	1799.4	1457.3	-342.1	19.0%	23.4%	338.4	342.1	114493.2	117031.9	
1993/94	1778.0	1741.8	-36.2	2.0%	2.5%	317.0	36.2	100463.7	1312.7	
1994/95	1917.2	1592.9	-324.3	16.9%	22.2%	456.1	324.3	208060.2	105159.1	
1995/96	1585.4	1409.2	-176.2	11.1%	12.1%	124.4	176.2	15469.1	31036.8	
1996/97	628.2	795.9	167.6	26.7%	11.5%	832.8	167.6	693556.1	28101.7	
1997/98	1440.8	1535.7	94.9	6.6%	6.5%	20.2	94.9	407.3	9006.6	
1998/99	490.9	553.8	62.9	12.8%	4.3%	970.2	62.9	941194.2	3959.8	
1999/00	1281.4	1398.3	116.9	9.1%	8.0%	179.7	116.9	32283.0	13670.9	
2000/01	1597.6	1635.1	37.5	2.3%	2.6%	136.6	37.5	18647.7	1408.0	
2001/02	1104.8	1636.1	531.3	48.1%	36.4%	356.3	531.3	126915.3	282263.5	
2002/03	2333.0	1984.4	-348.5	14.9%	23.9%	871.9	348.5	760273.4	121486.7	
PROM=	1461.0	1461.0	0.0	17.9%	17.2%	SUMA=	10356.7	7023.2	5888304.5	2586737.9

RESUMEN										
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES				
		FREC	%	FREC	%	N parámetros = 2		Residuos		
β*1= 0.64	E <=5%	5	18%	5	18%	N datos= 28	E1 = 18%	Promedio=	0.00	
β*2= 0.97	5%<= E <=10%	2	7%	3	11%			σ=	0.21	
β*3=	0%<= E <=15%	5	18%	3	11%			E2 = 17%	χ ² _(0,05) =	11.07
β*4=	5%<= E <=20%	6	21%	7	25%			E _{STD} = 303.95	χ ² (calculado)=	7.95
β*5=	20%<= E <=30%	6	21%	6	21%			E _{TIP} = 321.7	CUMPLE DISTRIBUCION NORMAL	
β*6=	30%<= E	4	14%	4	14%			R ² = 0.56		
Cte= -6.48	TOTAL=	28	100%	28	100%			C.B.= 1.5	ρ (Res-Yest)=	0.03

TABLA f3.2
AFLUENTES CENTRAL PANGUE - CAUDALES MEDIOS MENSUALES (m3/s)

CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm)
 $V(OC-MZ)=0.749 \cdot P(AB-SE) + 1.014 \cdot P(OC-MZ) + -0.641 \cdot Q(AB-SE) + -249.125$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P)-VD(O)	(<VD(O)>-VD(O)) ²	(VD(P)-VD(O)) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
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1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1808.6	1644.3	-164.4	9.1%	11.3%	347.6	164.4	120817.5	27016.3	
1976/77	1403.4	1540.6	137.3	9.8%	9.4%	57.7	137.3	3326.0	18847.2	
1977/78	1992.0	1475.7	-516.3	25.9%	35.3%	531.0	516.3	281948.3	266575.8	
1978/79	1627.3	1893.6	266.3	16.4%	18.2%	166.3	266.3	27651.8	70921.9	
1979/80	1821.5	2074.6	253.1	13.9%	17.3%	360.5	253.1	129963.8	64057.6	
1980/81	1197.2	1372.5	175.3	14.6%	12.0%	263.9	175.3	69628.2	30730.2	
1981/82	979.4	993.8	14.4	1.5%	1.0%	481.7	14.4	232010.4	207.7	
1982/83	2076.9	1951.9	-125.0	6.0%	8.6%	615.9	125.0	379355.2	15627.5	
1983/84	1408.2	1272.8	-135.5	9.6%	9.3%	52.8	135.5	2786.6	18348.9	
1984/85	2373.8	1882.2	-491.6	20.7%	33.6%	912.8	491.6	833113.9	241657.3	
1985/86	956.8	1157.9	201.1	21.0%	13.8%	504.2	201.1	254216.5	40442.6	
1986/87	1430.8	1703.5	272.6	19.1%	18.7%	30.2	272.6	912.1	74330.2	
1987/88	1286.5	955.7	-330.8	25.7%	22.6%	174.5	330.8	30462.5	109438.0	
1988/89	1275.4	1114.4	-161.0	12.6%	11.0%	185.7	161.0	34472.9	25921.6	
1989/90	1293.7	1534.8	241.2	18.6%	16.5%	167.4	241.2	28014.6	58157.8	
1990/91	866.0	803.0	-63.0	7.3%	4.3%	595.0	63.0	354026.5	3974.8	
1991/92	1154.7	1658.7	504.0	43.6%	34.5%	306.3	504.0	93834.4	253997.3	
1992/93	1799.4	1696.3	-103.1	5.7%	7.1%	338.4	103.1	114493.2	10630.4	
1993/94	1778.0	1721.1	-56.9	3.2%	3.9%	317.0	56.9	100463.7	3240.4	
1994/95	1917.2	1511.1	-406.1	21.2%	27.8%	456.1	406.1	208060.2	164878.6	
1995/96	1585.4	1345.1	-240.3	15.2%	16.4%	124.4	240.3	15469.1	57746.2	
1996/97	628.2	859.0	230.8	36.7%	15.8%	832.8	230.8	693556.1	53270.4	
1997/98	1440.8	1498.8	58.0	4.0%	4.0%	20.2	58.0	407.3	3361.8	
1998/99	490.9	617.2	126.3	25.7%	8.6%	970.2	126.3	941194.2	15960.3	
1999/00	1281.4	1495.5	214.1	16.7%	14.7%	179.7	214.1	32283.0	45846.1	
2000/01	1597.6	1879.2	281.6	17.6%	19.3%	136.6	281.6	18647.7	79293.4	
2001/02	1104.8	1360.1	255.3	23.1%	17.5%	356.3	255.3	126915.3	65198.0	
2002/03	2333.0	1895.5	-437.5	18.8%	29.9%	871.9	437.5	760273.4	191383.8	
PROM=	1461.0	1461.0	0.0	16.6%	15.8%	SUMA=	10356.7	6462.9	5888304.5	2011062.2

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros = 3		Residuos	
$\beta^*1= 0.75$	$ E \leq 5\%$	3	11%	4	14%	N datos= 28		Promedio=	0.00
$\beta^*2= 1.01$	$5\% < E \leq 10\%$	6	21%	5	18%	$ E1 = 17\%$		$\sigma =$	0.19
$\beta^*3= -0.64$	$0\% < E \leq 15\%$	3	11%	5	18%	$ E2 = 16\%$		$\chi^2_{(0.05)} =$	11.07
$\beta^*4=$	$5\% < E \leq 20\%$	7	25%	8	29%	$E_{STD} = 268.0$		$\chi^2_{(calculado)} =$	8.72
$\beta^*5=$	$20\% < E \leq 30\%$	7	25%	3	11%	$E_{TIP} = 289.5$		CUMPLE DISTRIBUCION NORMAL	
$\beta^*6=$	$30\% < E $	2	7%	3	11%	$R^2 = 0.66$			
Cte= -249.13	TOTAL=	28	100%	28	100%	C.B.= 1.6		P (Res-Yest)=	0.04

TABLA f3.3
AFLUENTES CENTRAL PANGUE - CAUDALES MEDIOS MENSUALES (m3/s)
 CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm)
 $V(OC-MZ)=0.949 \cdot I(MY-SE) + 1.02 \cdot P(OC-MZ) + 0.209 \cdot Q(AB-SE) + 25.426$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P)-VD(O)	(<VD(O)>-VD(O)) ²	(VD(P)-VD(O)) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
1959/60										
1960/61										
1961/62										
1962/63										
1963/64										
1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1808.6	1516.5	-292.1	16.2%	20.0%	347.6	292.1	120817.5	85340.6	
1976/77	1403.4	1536.8	133.5	9.5%	9.1%	57.7	133.5	3326.0	17817.3	
1977/78	1992.0	1467.8	-524.2	26.3%	35.9%	531.0	524.2	281948.3	274807.7	
1978/79	1627.3	1998.8	371.5	22.8%	25.4%	166.3	371.5	27651.8	138020.6	
1979/80	1821.5	2183.7	362.2	19.9%	24.8%	360.5	362.2	129963.8	131178.6	
1980/81	1197.2	1463.5	266.3	22.2%	18.2%	263.9	266.3	69628.2	70913.3	
1981/82	979.4	1038.9	59.6	6.1%	4.1%	481.7	59.6	232010.4	3548.2	
1982/83	2076.9	2038.1	-38.9	1.9%	2.7%	615.9	38.9	379355.2	1510.1	
1983/84	1408.2	1121.3	-286.9	20.4%	19.6%	52.8	286.9	2786.6	82325.6	
1984/85	2373.8	1714.4	-659.4	27.8%	45.1%	912.8	659.4	833113.9	434784.5	
1985/86	956.8	1117.5	160.6	16.8%	11.0%	504.2	160.6	254216.5	25799.6	
1986/87	1430.8	1568.2	137.4	9.6%	9.4%	30.2	137.4	912.1	18869.8	
1987/88	1286.5	1278.2	-8.3	0.6%	0.6%	174.5	8.3	30462.5	68.7	
1988/89	1275.4	1122.9	-152.5	12.0%	10.4%	185.7	152.5	34472.9	23258.3	
1989/90	1293.7	1642.1	348.5	26.9%	23.9%	167.4	348.5	28014.6	121432.2	
1990/91	866.0	1017.1	151.0	17.4%	10.3%	595.0	151.0	354026.5	22811.4	
1991/92	1154.7	1437.9	283.2	24.5%	19.4%	306.3	283.2	93834.4	80199.0	
1992/93	1799.4	1368.6	-430.8	23.9%	29.5%	338.4	430.8	114493.2	185556.3	
1993/94	1778.0	1604.1	-173.9	9.8%	11.9%	317.0	173.9	100463.7	30241.1	
1994/95	1917.2	1602.3	-314.9	16.4%	21.6%	456.1	314.9	208060.2	99151.6	
1995/96	1585.4	1409.6	-175.8	11.1%	12.0%	124.4	175.8	15469.1	30918.2	
1996/97	628.2	822.6	194.4	30.9%	13.3%	832.8	194.4	693556.1	37778.7	
1997/98	1440.8	1394.6	-46.2	3.2%	3.2%	20.2	46.2	407.3	2134.9	
1998/99	490.9	625.9	135.0	27.5%	9.2%	970.2	135.0	941194.2	18223.0	
1999/00	1281.4	1507.3	226.0	17.6%	15.5%	179.7	226.0	32283.0	51068.3	
2000/01	1597.6	1798.3	200.7	12.6%	13.7%	136.6	200.7	18647.7	40267.8	
2001/02	1104.8	1500.4	395.6	35.8%	27.1%	356.3	395.6	126915.3	156479.8	
2002/03	2333.0	2011.5	-321.4	13.8%	22.0%	871.9	321.4	760273.4	103308.9	
PROM=	1461.0	1461.0	0.0	17.3%	16.7%	SUMA=	10356.7	6850.6	5888304.5	2287813.9

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros = 3		Residuos	
$\beta^*1= 0.95$	$ E \leq 5\%$	3	11%	4	14%	N datos= 28		Promedio=	0.00
$\beta^*2= 1.02$	$5\% < E \leq 10\%$	4	14%	3	11%	$ E1 = 17\%$		$\sigma =$	0.19
$\beta^*3= -0.21$	$0\% < E \leq 15\%$	4	14%	7	25%	$ E2 = 17\%$		$\chi^2_{(0.05)} =$	11.07
$\beta^*4=$	$5\% < E \leq 20\%$	6	21%	5	18%	$E_{STD} = 285.8$		$\chi^2_{(calculado)} =$	5.72
$\beta^*5=$	$20\% < E \leq 30\%$	9	32%	7	25%	$E_{TIP} = 308.7$		CUMPLE DISTRIBUCION NORMAL	
$\beta^*6=$	$30\% < E $	2	7%	2	7%	$R^2 = 0.61$			
Cte= 25.43	TOTAL=	28	100%	28	100%	C.B.= 1.5		P (Res-Yest)=	0.03

TABLA f3.4
AFLUENTES CENTRAL PANGUE - CAUDALES MEDIOS MENSUALES (m3/s)
CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm) - RUTA DE NIEVE MESETA ALTO LOS MALLINES
 $V(OC-MZ)=0.26 \cdot I(MY-SE) + 0.714 \cdot P(OC-MZ) + 0.092 \cdot P(a-1) + 0.807 \cdot RN(AM) + -345.107$

AÑO	Observado	Pronosticada	Residuo	E1 _i	E2 _i	<VD(O)>-VD(O)	VD(P) _i -VD(O) _i	(<VD(O)>-VD(O)) _i ²	(VD(P) _i -VD(O) _i) ²	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
1959/60										
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1961/62										
1962/63										
1963/64										
1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1808.6	1881.8	73.2	4.0%	4.9%	311.7	73.2	97129.9	5354.3	
1976/77	1403.4	1205.5	-197.8	14.1%	13.2%	93.6	197.8	8761.5	39137.4	
1977/78	1992.0	1829.0	-163.0	8.2%	10.9%	495.1	163.0	245080.9	26568.2	
1978/79	1627.3	1641.5	14.2	0.9%	0.9%	130.4	14.2	16992.9	201.6	
1979/80	1821.5	1818.0	-3.6	0.2%	0.2%	324.6	3.6	105347.9	12.7	
1980/81	1197.2	1586.7	389.5	32.5%	26.0%	299.8	389.5	89881.9	151744.7	
1981/82	979.4	1132.2	152.8	15.6%	10.2%	517.6	152.8	267916.1	23347.0	
1982/83	2076.9	2195.2	118.3	5.7%	7.9%	580.0	118.3	336384.5	13986.6	
1983/84	1408.2	1323.4	-84.8	6.0%	5.7%	88.7	84.8	7871.2	7194.9	
1984/85	2373.8	2018.6	-355.2	15.0%	23.7%	876.8	355.2	768811.9	126156.6	
1985/86	956.8	963.2	6.4	0.7%	0.4%	540.1	6.4	291740.8	40.9	
1986/87	1430.8	1435.4	4.6	0.3%	0.3%	66.1	4.6	4373.5	20.8	
1987/88	1286.5	1407.4	120.9	9.4%	8.1%	210.5	120.9	44296.1	14613.5	
1988/89	1275.4	1302.7	27.4	2.1%	1.8%	221.6	27.4	49106.7	749.1	
1989/90	1293.7	1524.1	230.5	17.8%	15.4%	203.3	230.5	41333.8	53113.9	
1990/91	866.0	572.9	-293.1	33.8%	19.6%	630.9	293.1	398076.2	85928.3	
1991/92	1154.7	1244.6	89.9	7.8%	6.0%	342.3	89.9	117138.9	8084.3	
1992/93	1799.4	1722.5	-76.9	4.3%	5.1%	302.4	76.9	91468.1	5914.0	
1993/94	1778.0	1610.1	-167.9	9.4%	11.2%	281.0	167.9	78977.0	28189.3	
1994/95	1917.2	1603.6	-313.5	16.4%	20.9%	420.2	313.5	176571.9	98302.7	
1995/96	1585.4	1712.7	127.3	8.0%	8.5%	88.4	127.3	7822.2	16203.3	
1996/97	628.2	762.8	134.5	21.4%	9.0%	868.7	134.5	754694.8	18101.6	
1997/98	1440.8	1178.0	-262.9	18.2%	17.6%	56.1	262.9	3148.7	69104.2	
1998/99										
1999/00	1281.4	1377.9	96.5	7.5%	6.4%	215.6	96.5	46486.1	9311.9	
2000/01	1597.6	1721.5	123.9	7.8%	8.3%	100.6	123.9	10125.4	15357.5	
2001/02	1104.8	1478.6	373.8	33.8%	25.0%	392.2	373.8	153807.7	139738.7	
2002/03	2333.0	2168.1	-164.9	7.1%	11.0%	836.0	164.9	698904.4	27192.7	
PROM=	1497.0	1497.0	0.0	11.4%	10.3%	SUMA=	9494.4	4167.3	4912251.3	983670.5

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros = 4		Residuos	
$\beta^*1= 0.26$	$ E <=5\%$	7	26%	6	22%	N datos= 27		Promedio=	0.00
$\beta^*2= 0.71$	$5\%<= E <=10\%$	10	37%	9	33%	E1 = 11%		$\sigma=$	0.15
$\beta^*3= 0.09$	$0\%<= E <=15\%$	2	7%	5	19%	E2 = 10%		$\chi^2_{(0,05)}=$	11.07
$\beta^*4= 0.81$	$5\%<= E <=20\%$	4	15%	3	11%	$E_{STD} = 190.9$		$\chi^2_{(calculado)}=$	5.57
$\beta^*5=$	$20\%<= E <=30\%$	1	4%	4	15%	$E_{TIP} = 211.5$		CUMPLE DISTRIBUCION NORMAL	
$\beta^*6=$	$30\%<= E $	3	11%	0	0%	$R^2 = 0.80$			
Cte= -345.11	TOTAL=	27	100%	27	100%	C.B.= 2.3		P (Res-Yest)=	0.05

TABLA f3.5
AFLUENTES CENTRAL PANGUE - CAUDALES MEDIOS MENSUALES (m3/s)
CENTRAL PANGUE - PRECIPITACIONES MENSUALES (mm) - RUTA DE NIEVE MESETA ALTO LOS MALLINES
 $V(OC-MZ)=0.373 \cdot I(MY-SE) + 0.779 \cdot P(OC-MZ) + 0.056 \cdot Q(AB-SE) + 0.727 \cdot RN(AM) + 9.573$

AÑO	Observado	Pronosticad	Residuo	E1 _i	E2 _i	$ <VD(O)>-VD(O) $	$ VD(P)-VD(O) $	$(<VD(O)>-VD(O))^2$	$(VD(P)-VD(O))^2$	
1950/51										
1951/52										
1952/53										
1953/54										
1954/55										
1955/56										
1956/57										
1957/58										
1958/59										
1959/60										
1960/61										
1961/62										
1962/63										
1963/64										
1964/65										
1965/66										
1966/67										
1967/68										
1968/69										
1969/70										
1970/71										
1971/72										
1972/73										
1973/74										
1974/75										
1975/76	1808.6	1909.4	100.7	5.6%	6.7%	311.7	100.7	97129.9	10148.8	
1976/77	1403.4	1254.5	-148.8	10.6%	9.9%	93.6	148.8	8761.5	22150.6	
1977/78	1992.0	1826.9	-165.1	8.3%	11.0%	495.1	165.1	245080.9	27248.2	
1978/79	1627.3	1682.9	55.6	3.4%	3.7%	130.4	55.6	16992.9	3086.8	
1979/80	1821.5	1836.3	14.7	0.8%	1.0%	324.6	14.7	105347.9	217.4	
1980/81	1197.2	1506.4	309.2	25.8%	20.7%	299.8	309.2	89881.9	95618.2	
1981/82	979.4	1015.9	36.6	3.7%	2.4%	517.6	36.6	267916.1	1336.5	
1982/83	2076.9	2180.9	104.0	5.0%	6.9%	580.0	104.0	336384.5	10810.5	
1983/84	1408.2	1215.7	-192.5	13.7%	12.9%	88.7	192.5	7871.2	37061.1	
1984/85	2373.8	2064.6	-309.2	13.0%	20.7%	876.8	309.2	768811.9	95583.2	
1985/86	956.8	940.6	-16.2	1.7%	1.1%	540.1	16.2	291740.8	263.0	
1986/87	1430.8	1477.0	46.1	3.2%	3.1%	66.1	46.1	4373.5	2128.6	
1987/88	1286.5	1339.7	53.2	4.1%	3.6%	210.5	53.2	44296.1	2832.8	
1988/89	1275.4	1352.6	77.2	6.1%	5.2%	221.6	77.2	49106.7	5967.0	
1989/90	1293.7	1645.9	352.2	27.2%	23.5%	203.3	352.2	41333.8	124057.7	
1990/91	866.0	645.7	-220.3	25.4%	14.7%	630.9	220.3	398076.2	48536.1	
1991/92	1154.7	1308.0	153.3	13.3%	10.2%	342.3	153.3	117138.9	23493.7	
1992/93	1799.4	1627.0	-172.4	9.6%	11.5%	302.4	172.4	91468.1	29715.1	
1993/94	1778.0	1534.8	-243.2	13.7%	16.2%	281.0	243.2	78977.0	59150.8	
1994/95	1917.2	1482.9	-434.2	22.6%	29.0%	420.2	434.2	176571.9	188548.7	
1995/96	1585.4	1656.6	71.2	4.5%	4.8%	88.4	71.2	7822.2	5073.0	
1996/97	628.2	753.2	125.0	19.9%	8.3%	868.7	125.0	754694.8	15620.8	
1997/98	1440.8	1295.6	-145.2	10.1%	9.7%	56.1	145.2	3148.7	21096.7	
1998/99										
1999/00	1281.4	1572.6	291.3	22.7%	19.5%	215.6	291.3	46486.1	84837.5	
2000/01	1597.6	1769.9	172.3	10.8%	11.5%	100.6	172.3	10125.4	29680.8	
2001/02	1104.8	1423.5	318.7	28.8%	21.3%	392.2	318.7	153807.7	101556.5	
2002/03	2333.0	2098.8	-234.2	10.0%	15.6%	836.0	234.2	698904.4	54837.8	
PROM=	1497.0	1497.0	0.0	12.0%	11.3%	SUMA=	9494.4	4562.7	4912251.3	1100658.0

RESUMEN									
PARAMETROS DEL MODELO	INTERVALO	E1 _i		E2 _i		INDICADORES			
		FREC	%	FREC	%	N parámetros = 4		Residuos	
β*1= 0.37	E <=5%	7	26%	7	26%	N datos= 27		Promedio=	0.00
β*2= 0.78	5%<= E <=10%	5	19%	6	22%	E1 = 12%		σ=	0.15
β*3= -0.06	0%<= E <=15%	8	30%	6	22%	E2 = 11%		χ ² _(0,05) =	11.07
β*4= 0.73	5%<= E <=20%	1	4%	3	11%	E _{STD} = 201.9		χ ² _(calculado) =	6.05
β*5=	20%<= E <=30%	6	22%	5	19%	E _{TIP} = 223.7		CUMPLE DISTRIBUCION NORMAL	
β*6=	30%<= E	0	0%	0	0%	R ² = 0.78			
Cte= -9.57	TOTAL=	27	100%	27	100%	C.B.= 2.1		P (Res-Yest)=	0.06