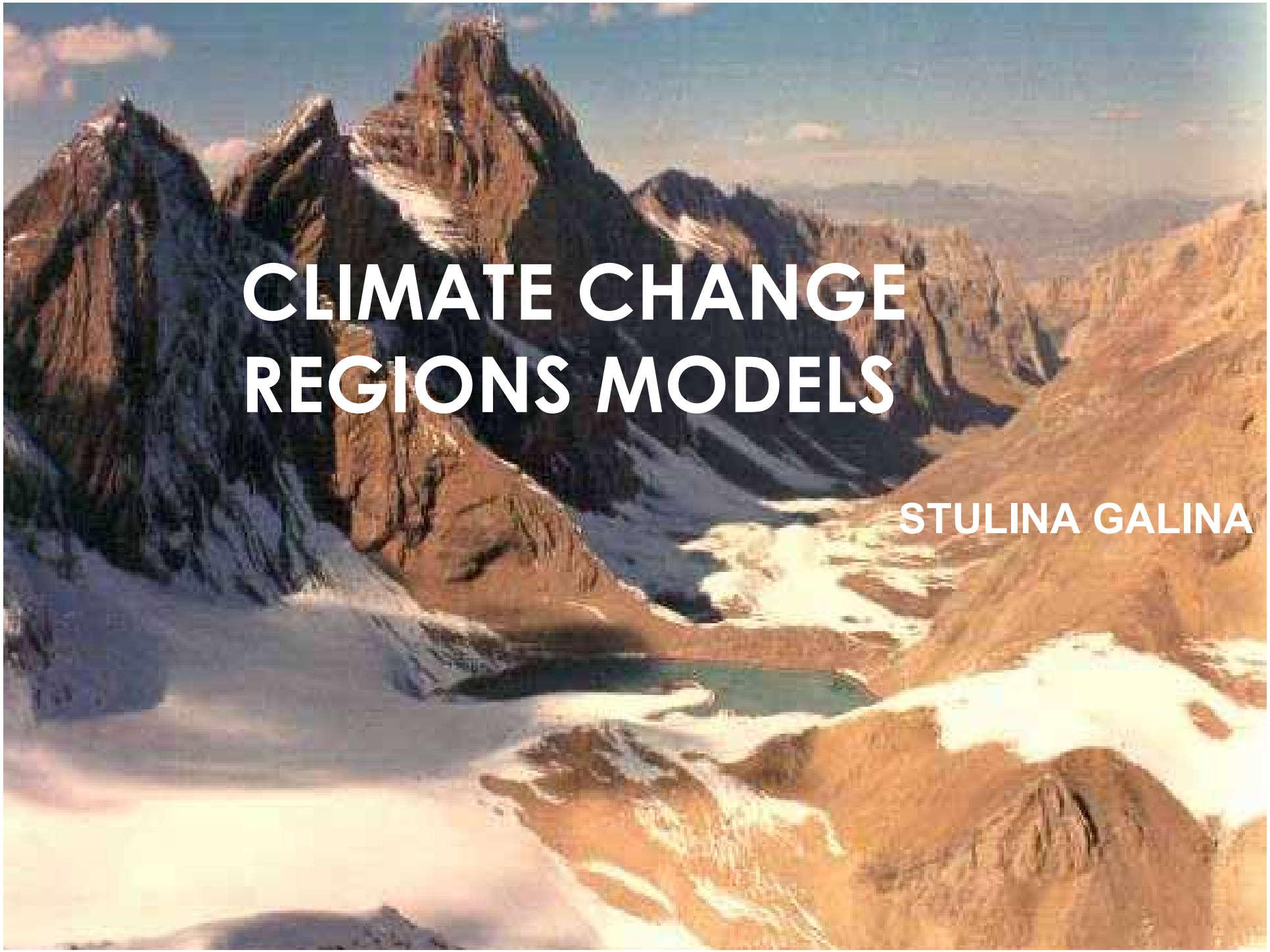
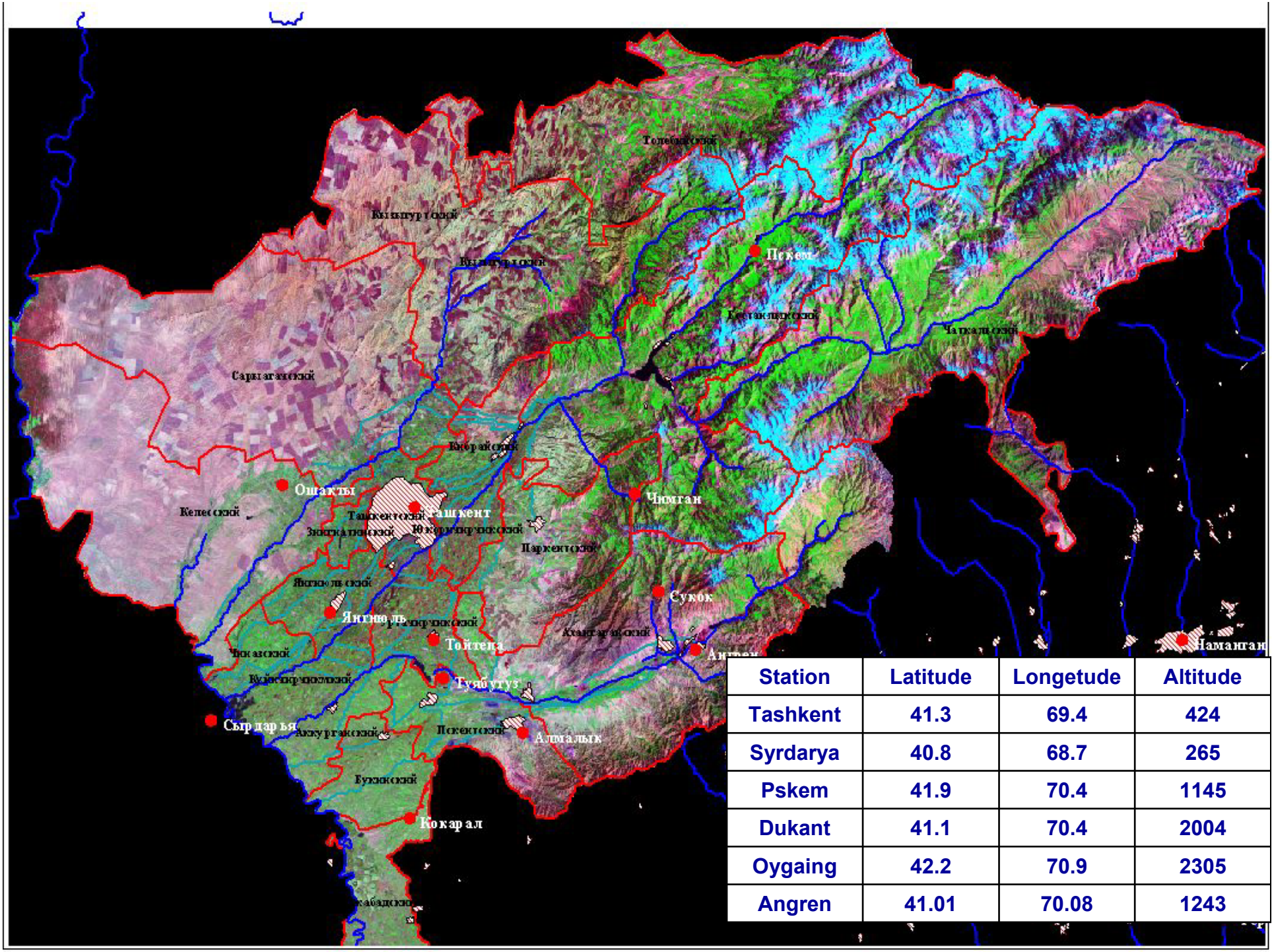
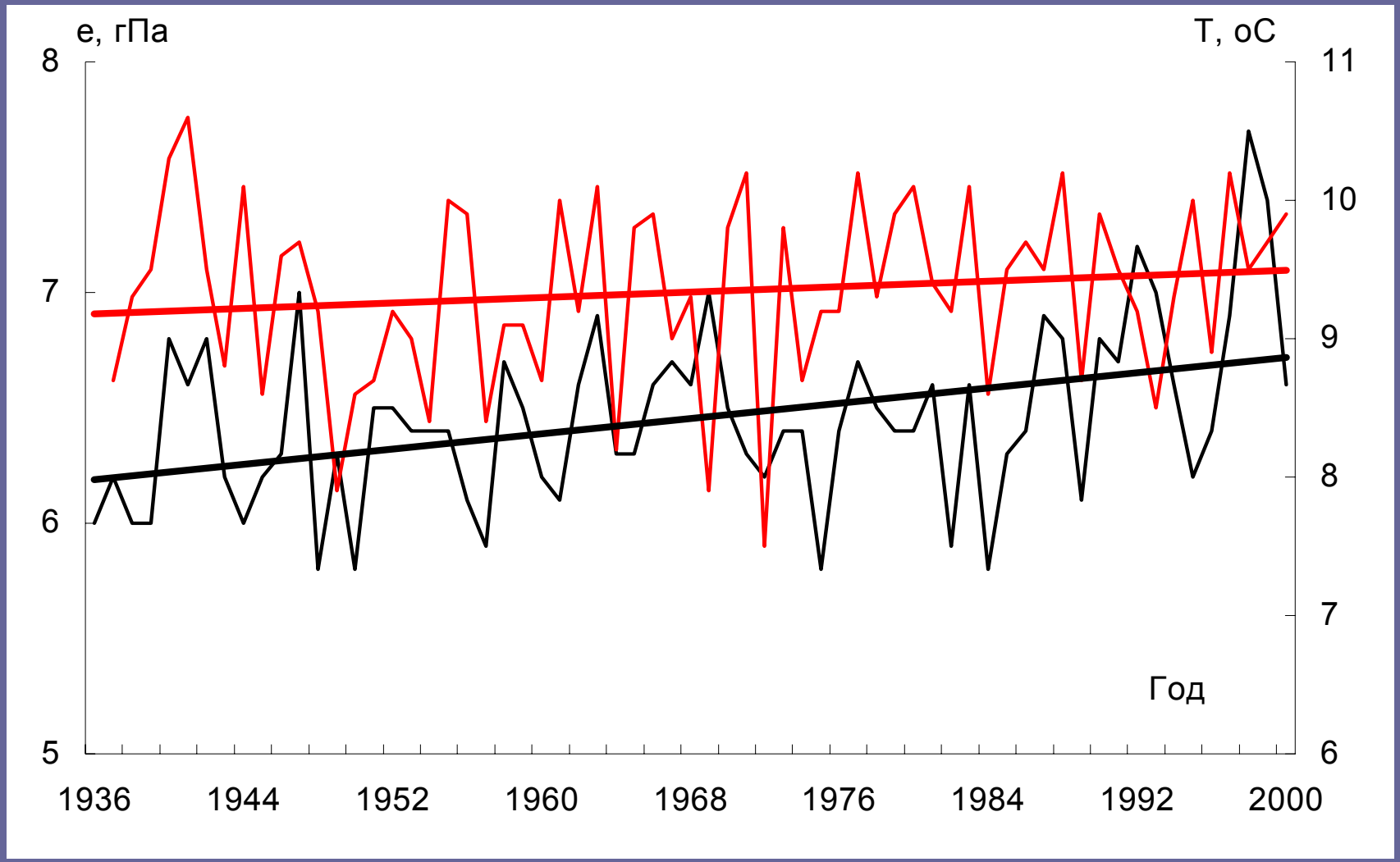

CLIMATE CHANGE
REGIONS MODELS
STULINA GALINA



Station	Latitude	Longetude	Altitude
Tashkent	41.3	69.4	424
Syrdarya	40.8	68.7	265
Pskem	41.9	70.4	1145
Dukant	41.1	70.4	2004
Oygaing	42.2	70.9	2305
Angren	41.01	70.08	1243

Changes in average annual air temperature (—) and vapor pressure (—) at the Pskem station.

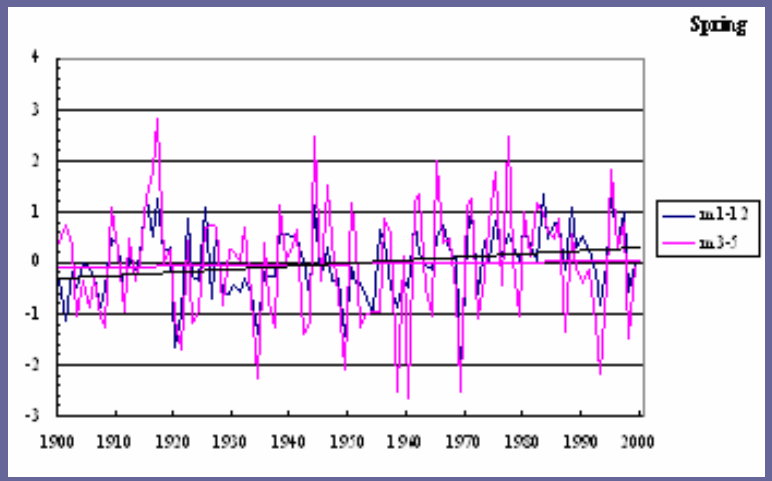


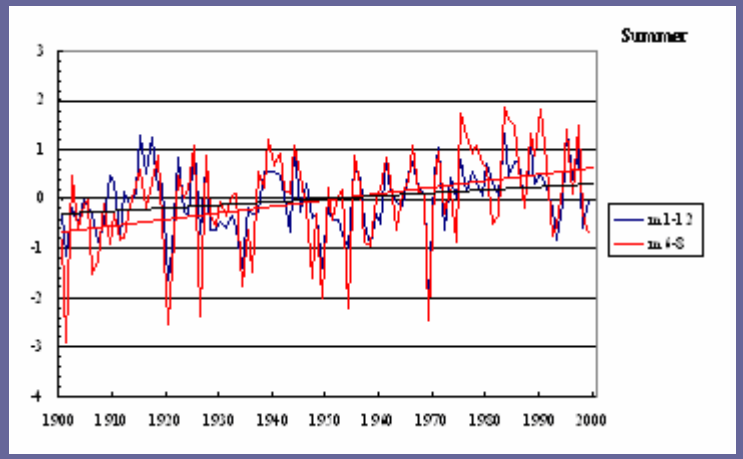
Aridity index

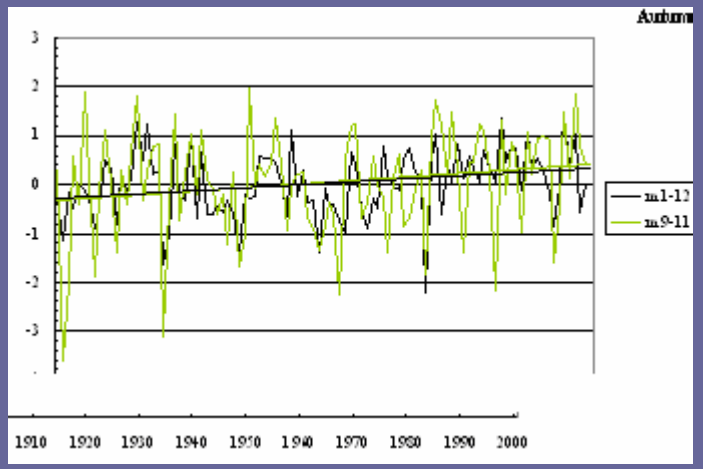
"Sazonov's index":

$$S = \frac{\Delta t_i}{\sigma_t} - \frac{\Delta P_i}{\sigma_p},$$

where Δt and σ_t – anomaly and mean-square deviation of average monthly temperature, ΔP and σp - anomaly and mean-square deviation of monthly precipitation totals

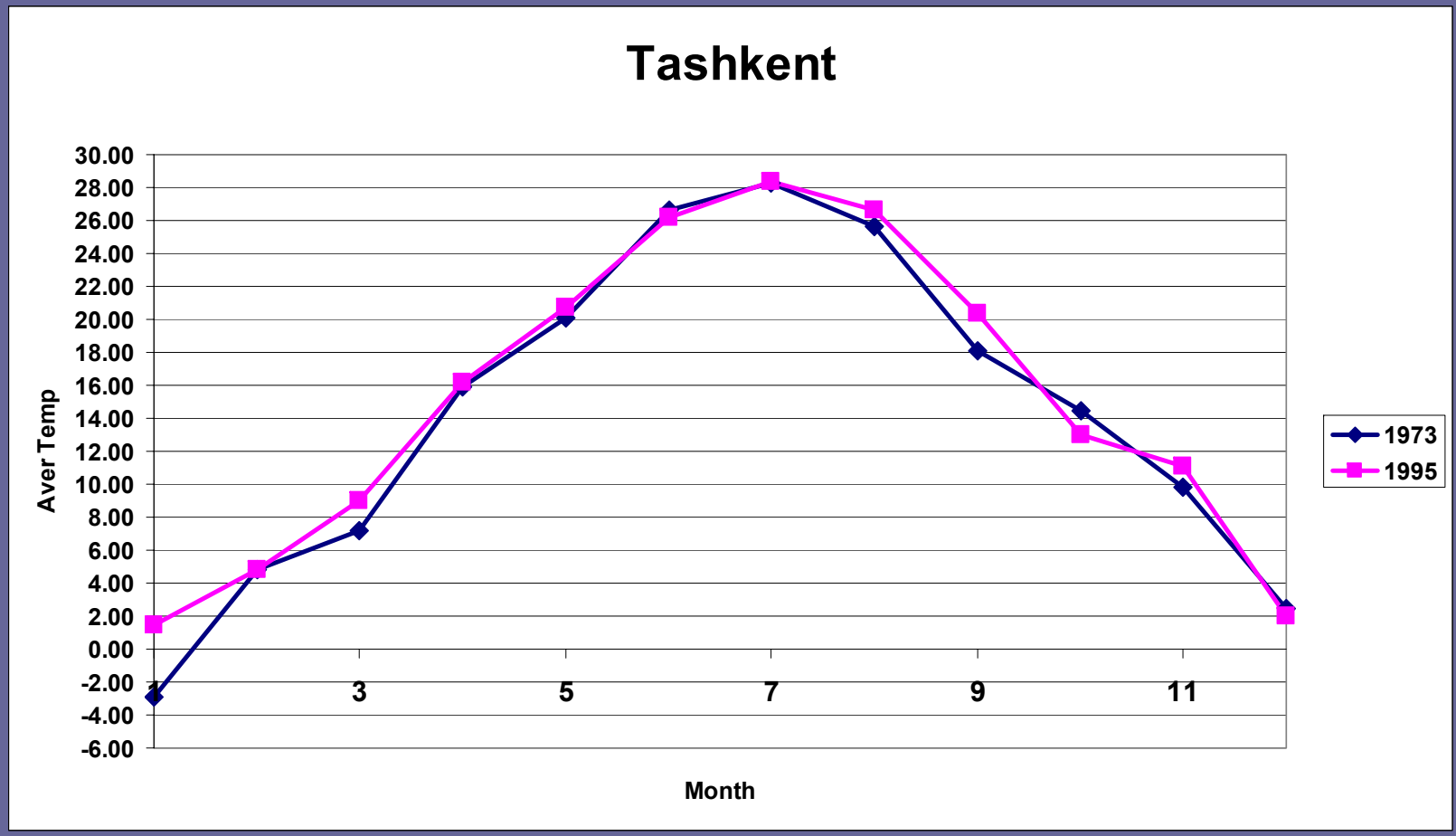




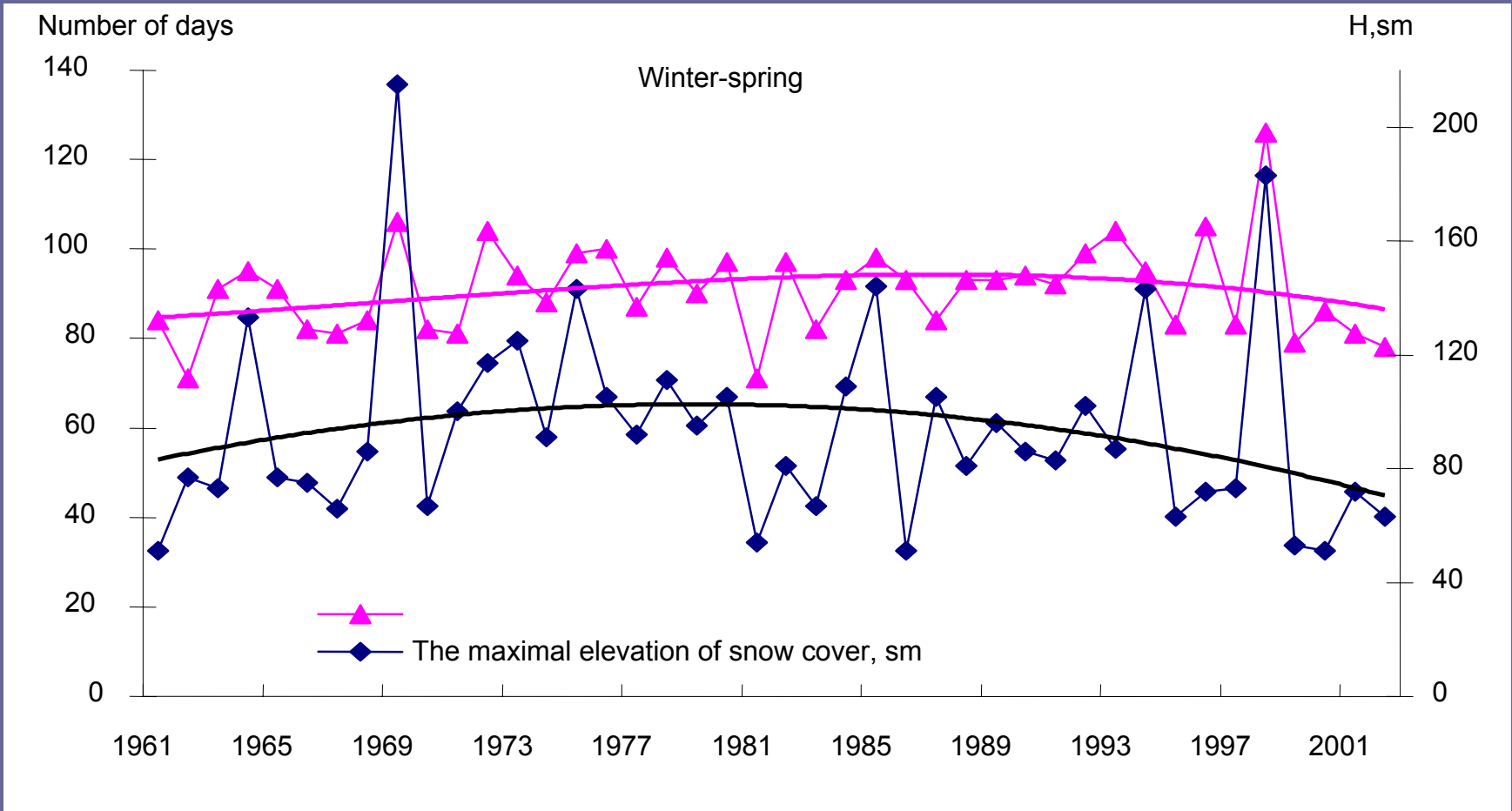


Changes of seasonal values of aridity index *S* for "Tashkent" station

Changes in average monthly air temperature at the Tashkent station



Changes in numbers of days with snow cover and its maximum depth at “Pskem” station



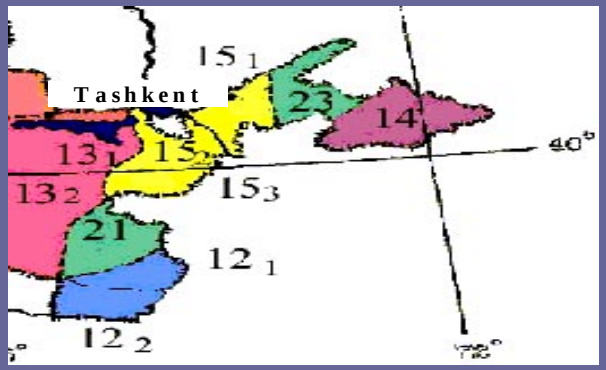
Scenarios for Climate changes

- **Scenarios based on dependences between global temperatures and regional climatic characteristics Emission scenarios: to be used in emission scenarios of IEGCC combined "in pairs" (IS92c and IS92d, - IS92a and IS92b, - IS92e and IS92f)**

  ab-*mild*, cd-*slight*, cd-*hard*

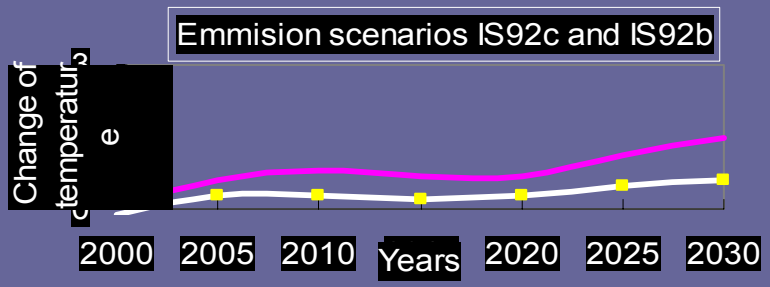
- **Scenarios development of regional climate change scenarios based on outputs generated in models of global climate**

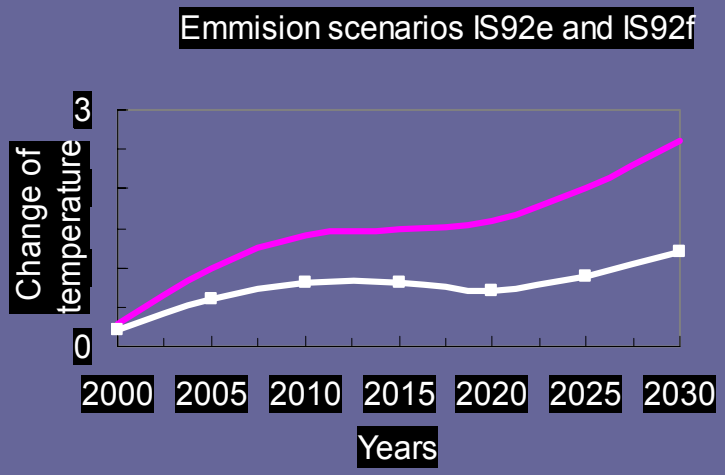
  1)HadCM2 (UK, Hadley Centre); 2) ECHAM4 (Germany, Max Planck Institute).



Scenarios for air temperature changes

to be used in emission scenarios of IEGCC





Number and name of climatic region	Climate of base period	Regional climatic scenario by 2030		
		ab	cd	ef
December-February				
15. Tashkent (15_1)	1.8	2.5	2.0	3.0
23. Western Tien Shan 1000-1500m a.s.l. (23_1)	-2.2	1.5	0.5	2.0
1600-2100m a.s.l. (23_2)	-10.8	1.5	0.5	2.0
March-May				
15. Tashkent (15_1)	14.5	1.0	0.5	1.5
23. Western Tien Shan 1000-1500m a.s.l. (23_1)	9.0	0.0	0.0	0.0
1600-2100m a.s.l. (23_2)	3.3	0.0	0.0	0.0
June-August				
15. Tashkent (15_1)	26.0	2.0	1.5	2.5
23. Western Tien Shan 1000-1500m a.s.l. (23_1)	20.8	0.0	0.0	0.0
1600-2100m a.s.l. (23_2)	15.0	0.0	0.0	0.0
September-November				
15. Tashkent (15_1)	13.6	2.0	0.5	2.0
2100-3000m a.s.l. (21_2)	6.0	1.0	1.0	1.0

The range of possible changes with regard to anomalies of average annual air temperature for the 15_1 and 23 climatic regions

Scenarios for precipitation changes

Station	Norm (mm)	Climatic scenarios		
		IS92ab	IS92cd	IS92ef
Pskem	823	109	107	111
Chatkal	437	105	103	108

Changes (%) in annual precipitation totals by 2030 in Uzbekistan and adjacent mountainous terrain as compared to 1961-1990

For emission scenarios cd:

1 - 100-105%; 2 - 105-110%; 3 - 110-115%;

For emission scenarios ab:

1 - 105-110%; 2 - 110-115%; 3 - 115-120%;

For emission scenarios ef:

1 - 110-115%; 2 - 115-120%; 3 - 120-125%.

Assessment of climatic change on the territory of Chirchik-Ahangaran hydrological area through application of existing simulation outputs and the empiric-statistical method indicates that we should expect some increase (from 0 up to 15%) in annual precipitation totals and rise in temperature during all seasons of the year

List of reference stations with their numbers as indicated in the unabridged register

Stations in Chirchik-Ahangaran area	
36. Tashkent	42. Pskem
37. Tuyabuguz	43. Dukant
38. Kokaral	44. Oygaing
39. Kaunchy	9. Chatcal (Kyrgyzstan)
40. Dalyverzin	
41. Syrdarya	

Changes in average monthly air temperatures in the ECHAM4 model by 2030

(deviations from reference norm)

Station number	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
36	1.6	1.7	0.6	0.5	1	0.7	0.7	1.1	0.9	0.8	0.6	0.7
37	1.7	2	0.6	0.5	0.8	0.5	0.6	0.9	0.6	0.7	0.3	0.7
38	1.7	2	0.6	0.5	1.1	0.5	0.7	1	0.8	0.8	0.5	0.7
39	1.7	1.9	0.6	0.5	0.9	0.7	0.7	0.7	0.8	0.7	0.5	0.9
40	1.7	2	0.6	0.5	1	0.6	0.6	1	0.6	0.5	0.5	0.9
41	1.7	2	0.6	0.5	1	0.5	0.6	0.8	0.8	0.6	0.4	0.8
42	1.2	1.4	0.7	0.6	0.9	0.9	1.4	1.4	1.4	1.2	0.4	0.7
43	1.1	1.3	0.8	0.6	0.9	1.2	1.3	1.3	1.7	1.4	0.9	0.6
44	0.9	1.3	0.8	0.9	1.4	1	1.5	1.4	1.6	0.8	0.4	0.7
9	0.6	0.8	1	1.1	0.5	0.7	0.9	1.1	0.9	0.9	0.9	1

Changes in average monthly air temperatures in the HadCM2 model by 2030 (deviations from reference norm)

Station number	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
36	1	1.1	0.4	0.4	0.6	0.5	0.3	0.8	0.7	0.9	0.3	0.6
37	1	1.2	0.4	0.4	0.5	0.3	0.3	0.6	0.4	0.9	0.3	0.6
38	1.1	1.2	0.4	0.4	0.8	0.3	0.6	0.9	0.7	0.8	0.3	0.6
39	1	1.2	0.4	0.4	0.6	0.5	0.5	0.5	0.7	0.8	0.3	0.8
40	1.1	1.2	0.4	0.4	0.8	0.4	0.4	0.7	0.4	0.7	0.3	0.8
41	1.1	1.2	0.4	0.4	0.7	0.4	0.3	0.6	0.6	0.7	0.3	0.7
42	0.8	0.9	0.4	0.4	0.6	0.6	0.8	1	1.1	1.2	0.3	0.7
43	0.7	1.1	0.4	0.5	0.6	0.8	0.7	1	1.2	1.5	0.7	0.6
44	0.6	0.9	0.5	0.7	1	0.5	0.9	1.1	1.2	0.7	0.3	0.6
9	0.6	0.8	1	1.1	0.5	0.7	0.9	1.1	0.9	0.9	0.9	1

Changes in precipitation in the ECHAM4 model by 2020 (ratio to the reference norm in %)

Station number	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
36	103	106	123	105	92	142	196	192	121	90	117	114
37	103	112	117	106	90	190	166	100	107	91	128	126
38	102	112	115	106	85	94	128	100	111	91	127	130
39	104	110	118	105	93	128	178	100	130	90	121	122
40	102	111	115	106	91	76	153	118	114	94	126	122
41	103	114	121	109	95	88	144	100	102	91	122	125
42	105	107	116	104	93	101	138	134	117	90	109	114
43	103	109	114	107	92	120	138	160	119	90	120	122
44	103	108	117	104	92	99	143	140	108	91	122	117
9	105	105	105	101	95	89	131	124	121	94	108	115

Changes in precipitation in the HadCM2 model by 2020 (ratio to the reference norm in %)

Station number	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
36	115	121	107	97	116	183	160	149	107	123	122	115
37	118	121	108	97	116	183	100	134	109	130	131	118
38	119	120	107	92	106	183	100	137	109	130	134	119
39	117	121	106	101	116	183	100	156	108	128	126	117
40	116	121	108	97	88	183	140	145	114	130	127	116
41	120	121	109	104	104	183	100	126	108	129	129	120
42	115	121	108	99	116	158	145	146	102	114	121	115
43	117	121	110	97	116	168	160	149	105	127	129	117
44	117	121	108	97	115	171	150	130	105	130	125	117
9	114	113	106	100	96	149	134	146	111	114	126	114

Average values of relative humidity (%) for the period of 1991-2000 (as analog humidity scenario)

Station number	Months											
	1	2	3	4	5	6	7	8	9	10	11	12
36	73	68	63	59	58	48	44	44	49	59	69	72
37	81	76	68	60	56	45	44	45	48	57	71	80
38	87	84	76	69	65	56	58	63	65	69	79	86
39	85	80	71	63	59	49	47	50	54	63	76	85
40	80	76	73	65	60	50	51	57	61	69	77	80
41	88	83	76	70	65	58	59	62	64	72	82	88
42	69	68	67	60	62	54	47	39	41	53	65	70
43	57	61	68	62	61	49	43	39	42	50	56	56
44	72	72	75	72	65	61	57	49	49	59	69	71

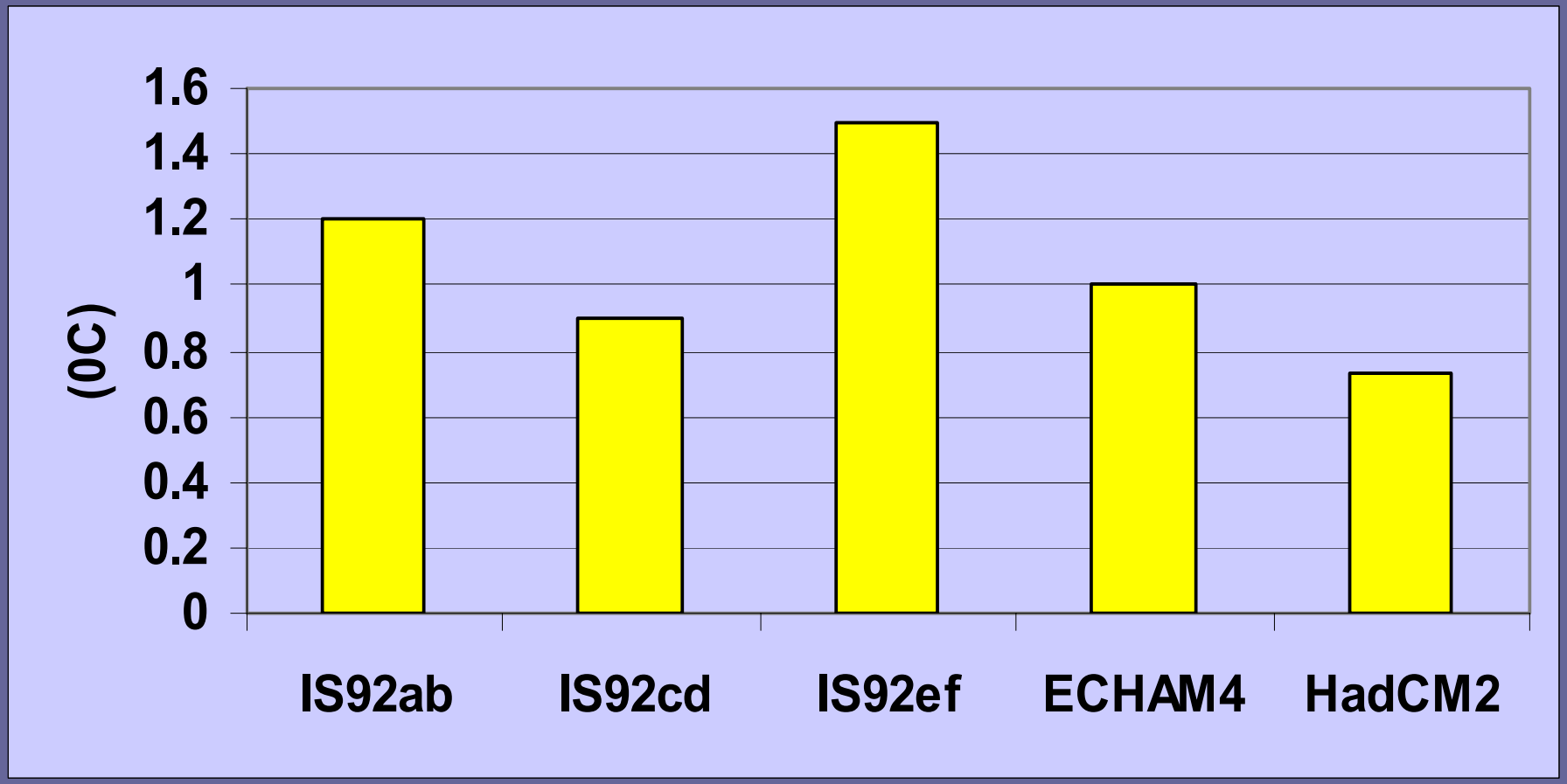
Norms and possible changes in river flows on the territory of Chirchik-Ahangaran hydrological area by 2030 under various climatic scenarios

River	Q	Q_{norm}	Q in % of norm for various climatic scenarios		
			IS92ab	IS92cd	IS92ef
Ahangaran	$Q_{vegetation}$	33.8	103	102	106
	Q_{year}	20.9	106	103	109
Chatkal	$Q_{vegetation}$	179	103	102	105
	Q_{year}	112	105	103	106
Pskem	$Q_{vegetation}$	118	98	98	95
	Q_{year}	73.5	99	99	98
Inflow to	$Q_{vegetation}$	297	98	98	93
Charvak W/R	Q_{year}	185	100	99	97

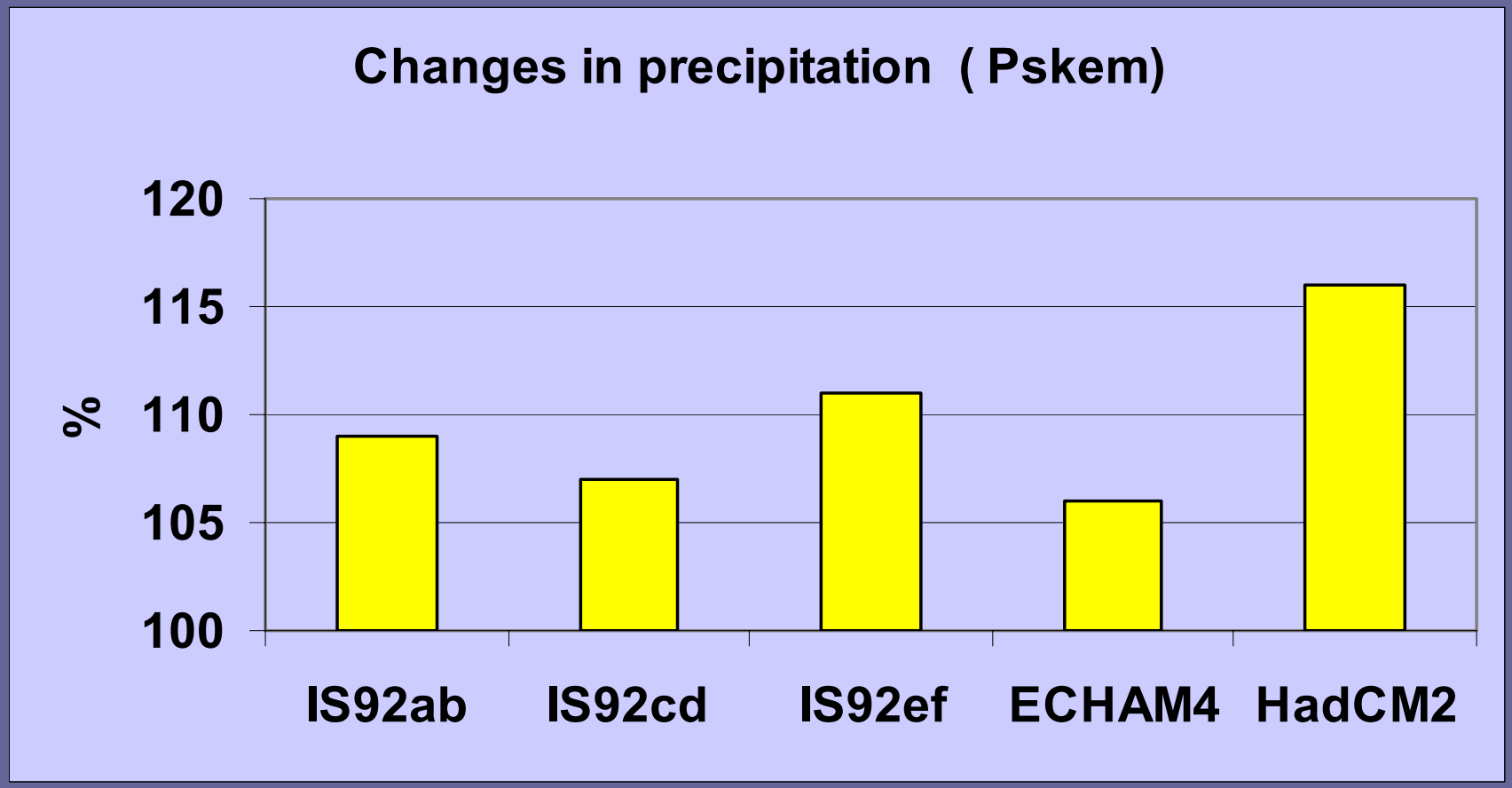
Norms and possible changes in river flow during vegetation in Chirchik-Ahangaran hydrological area by 2025 under various climatic scenarios

River	Q	Q_{norm}	Q in % of norm for various climatic scenarios		
			ECHAM4	HadCM2	IS92ab(1)
Chatkal	$Q_{vegetation}$	212	92	97	88
Pskem	$Q_{vegetation}$	126	99	103	105
Inflow to Charvak reservoir	$Q_{vegetation}$	338	94	99	94

Scenarios for annual temperature changes



Scenarios for precipitation changes



Glaciers and climatic changes

- Calculations made on the basis of “transient state” scenarios display that in the nearest future there will be no significant changes in river flow of the region, though some decrease is expected due to rise of global temperature (2-6%). Because of increasing aridity of climate, melted snow water is expected to contribute less to the flow (5-10%), seasonal snow area will shrink; the beginning of seasonal snow melting will shift by 1-4 weeks. Share of rain flow may augment by 7-10% - this causing negative impact on snow reserves.