Total cloudiness changes during 1983-2006 from ISCCP data

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Clouds play an important role in regulating the flow of radiation at the top of the atmosphere and at the surface (IPCC, 2007). The response of cloudiness to increasing greenhouse gases and temperature represents one of the largest uncertainties in climate model predictions.

Changes in total cloudiness from ISCCP data (Rossow and Duenas, 2004) in last two decades were estimated. D2 product, which correspond monthly averaged values on grid 2,5°x2,5° and cover time period from July 1983 to June 2006 was used.

According to this data, total cloudiness decreases from the middle eighties to the end of previous century (Fig. 1) (Mokhov and Chernokulsky 2003; Chernokulsky and Mokhov, 2006, Chernokulsky 2007). Global averaged cloudiness trend n from 1987 to 2000 is equal to -0.0027 yr^{-1} (corresponding coefficient of correlation r amount -0.96). But since 2001 cloudiness began to growth ($n = 0,0005$ yr^{-1}, $r = 0.3$) so finally n for all period is equal to -0.0017 yr^{-1} ($r = -0.88$).
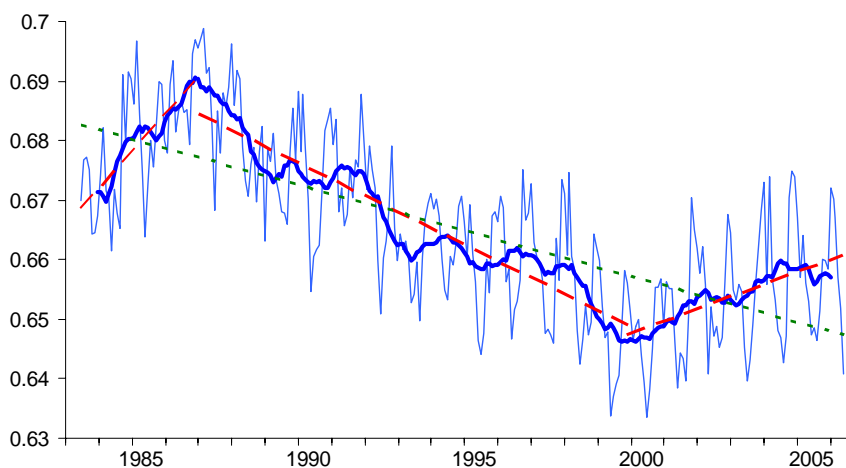

Fig.1 Global averaged cloudiness changes from July 1983 to June 2006 (blue curve), its 12 month moving average (blue thick curve), trend-line for all period (green short-dashed line), and trend-lines for period with cloudiness rise and decrease (red long-dashed line)

The same tendencies take place not only in global mean, but also in regional scale (tropic and midlatitude in both hemisphere) and both for ocean and for land surface (Table1). Cloudiness maximums for all regions note at period between 1985 and 1988 years, with only one exception (for land in southern hemisphere's midlatitude it is 1992). Cloudiness minimums note at 1998-2002 years, except land in southern tropical zone (1994) and southern midlatitude zone (1993 for ocean and 1996 for land).

The highest modulo of n observed in northern hemisphere tropical zone beneath ocean surface ($n = -0.0031$, $r = -0.85$). The lowest modulo n obtained in southern midlatitude zone beneath ocean surface ($n = -0.0004$, $r = -0.44$). In addition, total cloudiness here has a highest value (0.83). The lowest value observed beneath land in northern tropical zone (0.5), and global mean cloudiness equal 0.67.

Table 1. Statistical characteristic of total cloudiness in different region

Region			mean	max	min	Trend (n)+ STD (yr^{-1})	r
Global	NH+SH (90S-90N)	Ocean+Land	0.67	0.69 (1987)	0.65 (2000)	-0.0017±0.0002	-0.88
		Ocean	0.70	0.73 (1986)	0.68 (2000)	-0.0018±0.0002	-0.86
		Land	0.57	0.59 (1987)	0.55 (2002)	-0.0014±0.0002	-0.86
	NH (EQ-90N)	Ocean+Land	0.64	0.67 (1987)	0.62 (2000)	-0.0019±0.0003	-0.86
		Ocean	0.68	0.71 (1986)	0.66 (1998)	-0.0023±0.0003	-0.86
		Land	0.58	0.61 (1987)	0.56 (2000)	-0.0014±0.0003	-0.77
	SH (90S-EQ)	Ocean+Land	0.69	0.71 (1987)	0.67 (1999)	-0.0014±0.0002	-0.85
		Ocean	0.72	0.74 (1987)	0.70 (1999)	-0.0014±0.0002	-0.79
		Land	0.54	0.56 (1986)	0.51 (2002)	-0.0016±0.0003	-0.75
Tropical zone	NH+SH (30S-30N)	Ocean+Land	0.60	0.63 (1985)	0.57 (2000)	-0.0026±0.0003	-0.89
		Ocean	0.62	0.66 (1985)	0.59 (2000)	-0.0028±0.0003	-0.88
		Land	0.52	0.55 (1988)	0.50 (2001)	-0.0020±0.0003	-0.85
	NH (EQ-30N)	Ocean+Land	0.59	0.62 (1986)	0.56 (2000)	-0.0028±0.0004	-0.86
		Ocean	0.62	0.66 (1985)	0.59 (1998)	-0.0031±0.0004	-0.85
		Land	0.50	0.53 (1988)	0.46 (2000)	-0.0021±0.0004	-0.73
	SH (30S-EQ)	Ocean+Land	0.60	0.63 (1985)	0.58 (1999)	-0.0024±0.0003	-0.88
		Ocean	0.62	0.65 (1987)	0.59 (1999)	-0.0026±0.0004	-0.84
		Land	0.55	0.58 (1986)	0.53 (1994)	-0.0019±0.0003	-0.81
Mid-latitude zone	NH (30N -60N)	Ocean+Land	0.69	0.72 (1987)	0.67 (2000)	-0.0015±0.0003	-0.77
		Ocean	0.77	0.80 (1986)	0.75 (2000)	-0.0018±0.0003	-0.81
		Land	0.60	0.63 (1987)	0.58 (2000)	-0.0012±0.0003	-0.66
	SH (60S-30S)	Ocean+Land	0.81	0.83 (1986)	0.80 (1993)	-0.0004±0.0002	-0.45
		Ocean	0.83	0.84 (1986)	0.82 (1993)	-0.0004±0.0002	-0.44
		Land	0.55	0.58 (1992)	0.53 (1996)	-0.0006±0.0004	-0.30

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