Permafrost models intercomparison

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About 25 per cent of the total Northern Hemisphere land area is covered by permafrost. Here the preliminary results of the intercomparison of the models for permafrost evaluation are presented.

An intercomparison is performed for four particular models: integral permafrost model, IPM (Kudryavtsev et al., 1984), differential models developed at the State Hydrological Institute, SHI, (Anisimov, 1998), the State Hydrological Institute - A.M.Obukhov Insitute of Atmospheric Physics RAS, SHI-IAP RAS (which is based on (Woelbroeck, 1993)) and at the Institute of Numerical Mathematics RAS, INM RAS (Volodina, 2001). The computations are made for a number of selected Russian sites where observational data for the last few decades exist: Yakutsk (62N 129E), Tiksi (72N 128E), Marre-Sale (69N 66E), Vorkuta (67N 64E) for different soil types. Meteorological variables are taken from the NCEP/NCAR reanalysis climatology (Kalnay et al., 1996) for 1979-1995.

The results of this intercomparison are presented in Table 1 and in Fig.1 The models show considerable scatter. As a whole the INM RAS model show larger seasonal thaw depths in comparison to other models.

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Table 1: Seasonal thaw depths (in centimeters) for analyzed models in comparison to observations.

	Marre-Sale				Vorkuta				Yakutsk				Tiksi			
	INM RAS	IPM	SHI	SHI-IAP RAS	INM RAS	IPM	SHI	SHI-IAP RAS	INM RAS	IPM	SHI	SHI-IAP RAS	INM RAS	IPM	SHI	SHI-IAP RAS
loam	136	72	113	105	153	127	115	145	193	170	160	165	140	98	97	105
sand	157	88	120	118	204	155	122	160	263	207	174	175	156	118	100	110
clay	140	64	105	100	161	100	105	135	184	146	150	145	136	84	92	95
peat	76	24	49	30	64	82	48	35	131	41	65	45	72	76	46	27
observations	55 - 175				43 – 113				118 – 204				42 - 47			

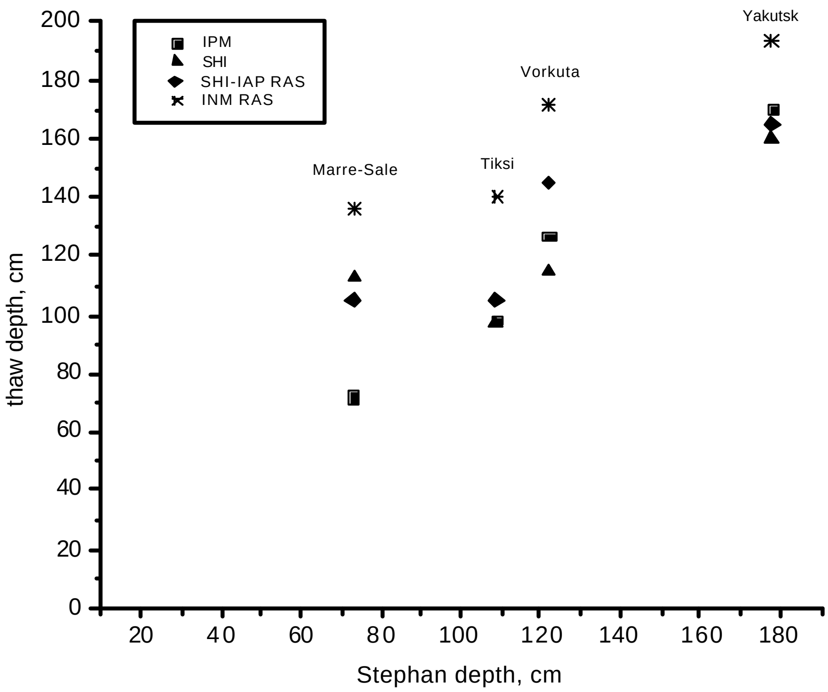

Fig.1: Seasonal thaw depths (in centimeters) for analyzed models as a function of the Stephan depth for loam soil type (see legend. Stephan depth is a seasonal thaw depth in the simplified soil thawing problem (Kudryavtsev et al., 1984).

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