Supplementary Material:

Spatially distributed simulations of the effect of snow on mass balance and flooding of Antarctic sea ice

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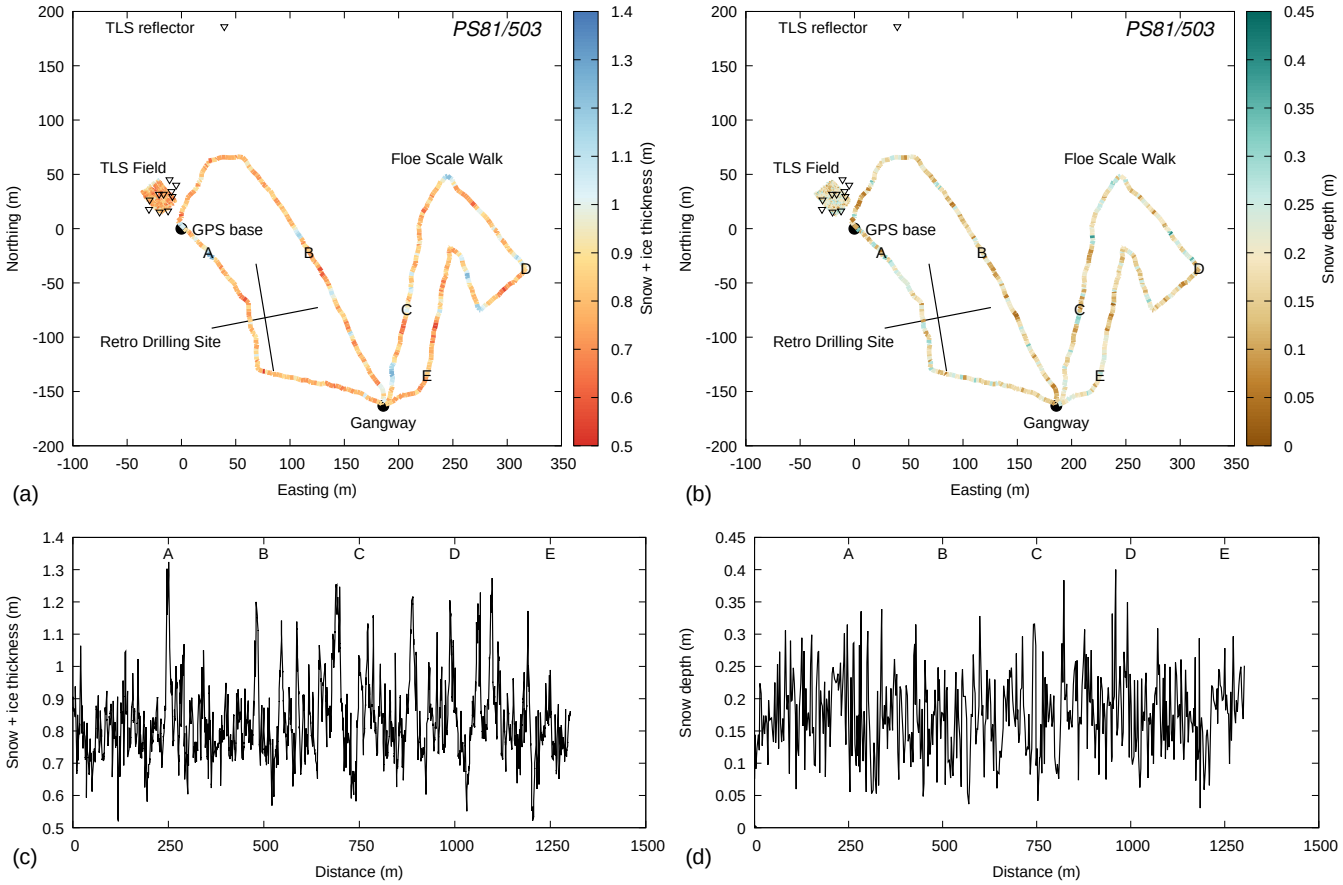

Figure S1: Map of ice station PS81/503 in a floe-based coordinate system, with northing and easting aligned with WGS 84 / UTM zone 28S (EPSG 32728) at the start of the magnaprobe survey, with colours denoting (a) snow + ice thickness from GEM-2, and (b) snow depth from Magnaprobe. The black dot denotes the GPS base station, triangles denote TLS reflectors, and black lines denote the Retro-Drilling transects. Lower panels show snow + ice thickness (c) and snow depth (d) along the floe-scale walk, with markers A to E showing corresponding points between the graphs and the maps in (a) and (b).

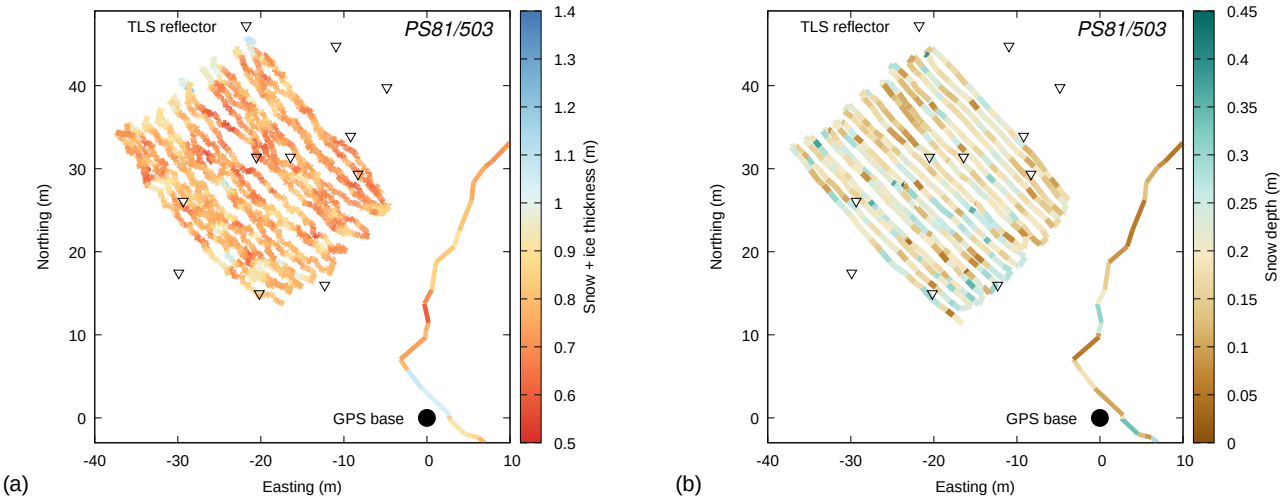

Figure S2: Map detail of Fig. S1 in this Supplementary Material, showing the TLS field of ice station PS81/503 in a floe-based coordinate system, with northing and easting aligned with WGS 84 / UTM zone 28S (EPSG 32728) at the start of the magnaprobe survey, with colours denoting (a) snow + ice thickness from GEM-2, and (b) snow depth from Magnaprobe. The black dot denotes the GPS base station and triangles denote TLS reflectors.

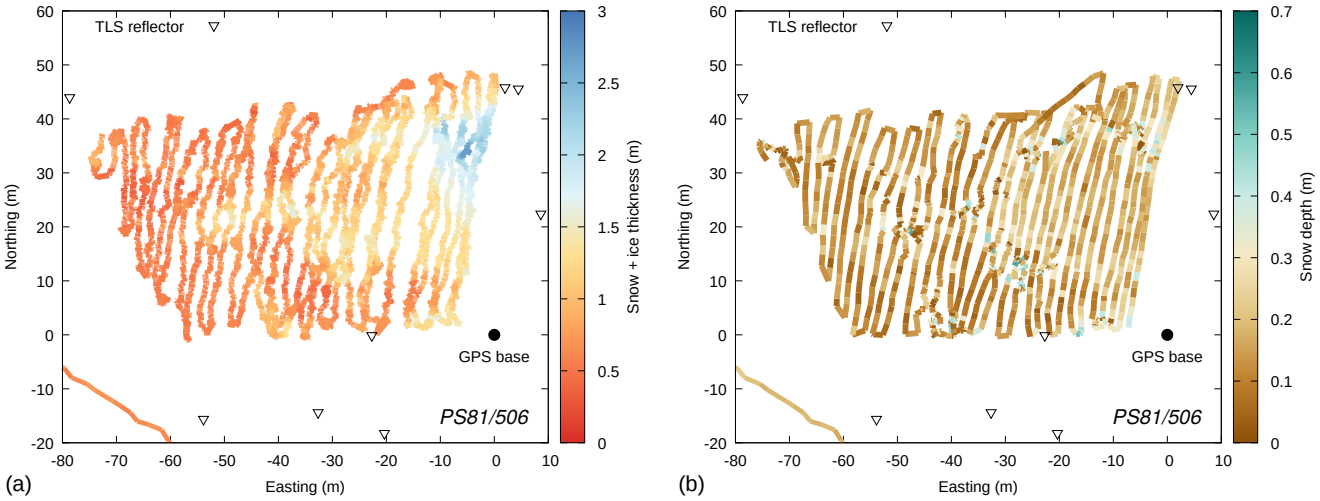

Figure S3: Map detail of Fig. 2 in main article, showing the TLS field of ice station PS81/506 in a floe-based coordinate system, with northing and easting aligned with WGS 84 / UTM zone 27S (EPSG 32727) at the start of the magnaprobe survey, with colours denoting (a) snow + ice thickness from GEM-2, and (b) snow depth from Magnaprobe. The black dot denotes the GPS base station, triangles denote TLS reflectors, and black lines denote the Retro-Drilling transects.

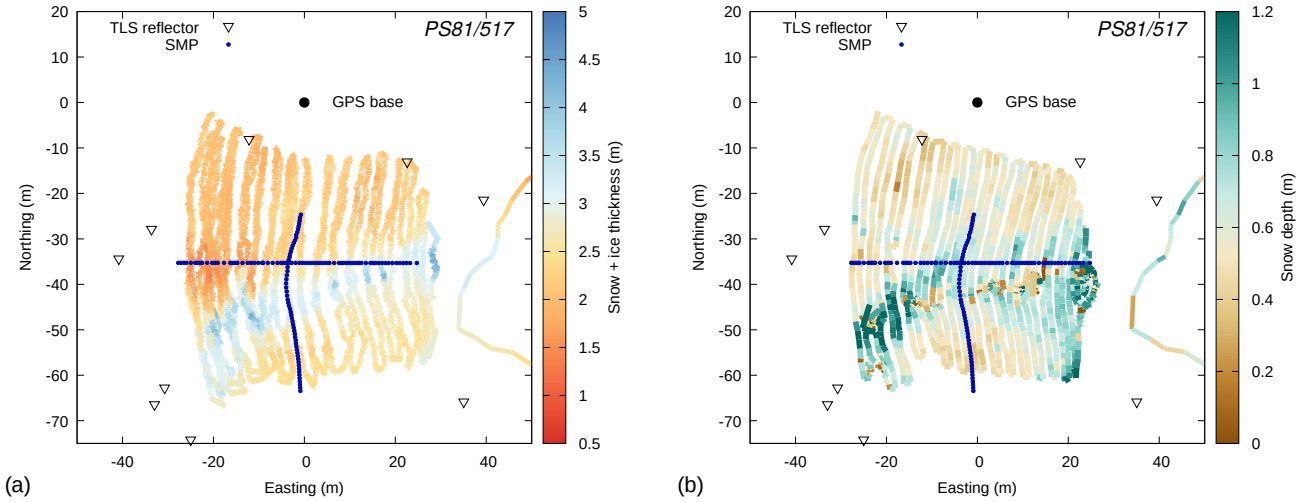

Figure S4: Map detail of Fig. 3 in main article, showing the TLS field of ice station PS81/517 in a floe-based coordinate system, with northing and easting aligned with WGS 84 / UTM zone 22S (EPSG 32722) at the start of the magnaprobe survey, with colours denoting (a) snow + ice thickness from GEM-2, and (b) snow depth from Magnaprobe. Black dots denote GPS surveyed points, triangles denote TLS reflectors, and black lines denote the Retro-Drilling transects. The blue lines in the TLS field denote the SMP transects.

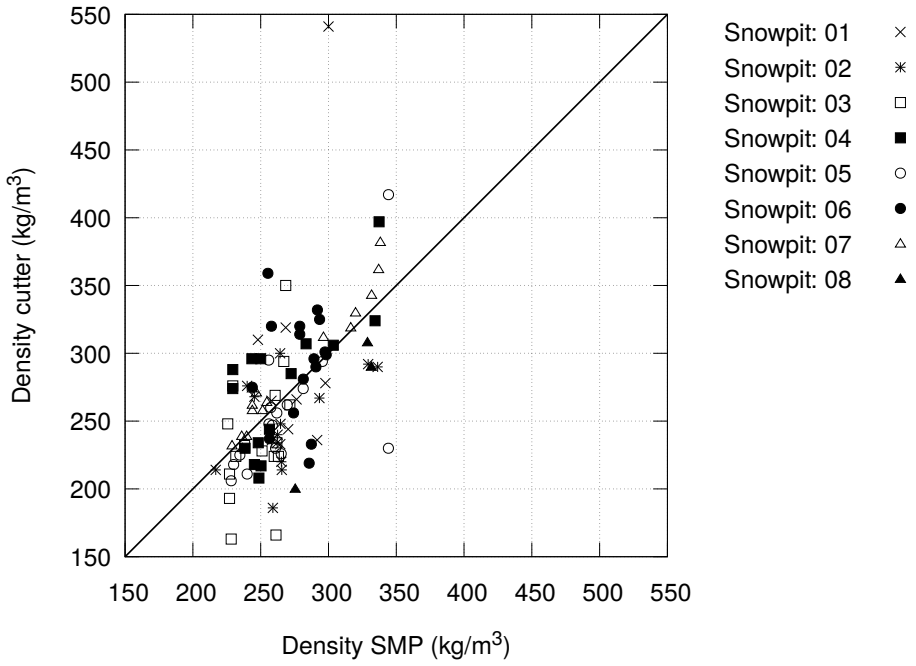

Figure S5: Results of the calibration of the SMP, showing density from snow pit measurements and SMP over collocated 3 cm segments of the snowpack.

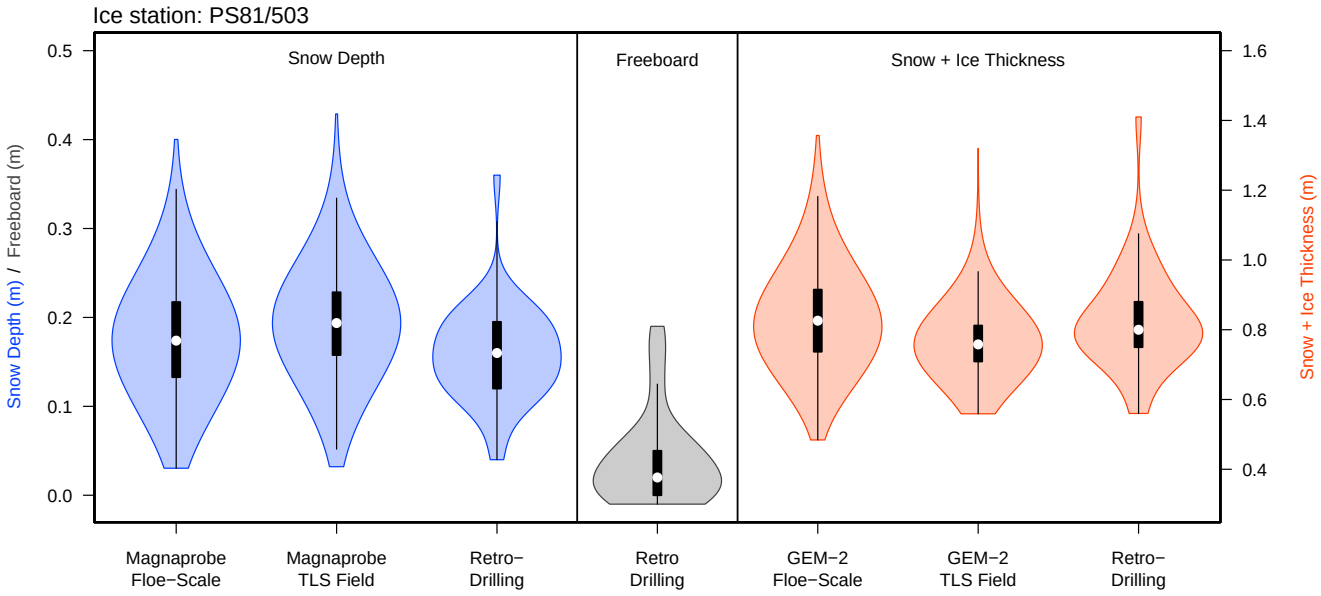

Figure S6: Snow thickness, freeboard and snow+ice thickness distributions for ice station PS81/503, based on floe-scale Magnaprobe, Magnaprobe inside the TLS field, and the Retro-Drilling survey. Distributions are shown as violin plots (Hintze and Nelson, 1998). The violin plot combines a box plot (shown in black, indicating the median by a white dot, the interquartile range by a black box, and either the minimum or maximum value, or 1.5 times the interquartile range, whichever is closer to the median, by the black lines) with a symmetrically plotted rotated kernel density which shows the full, smoothed, distribution.

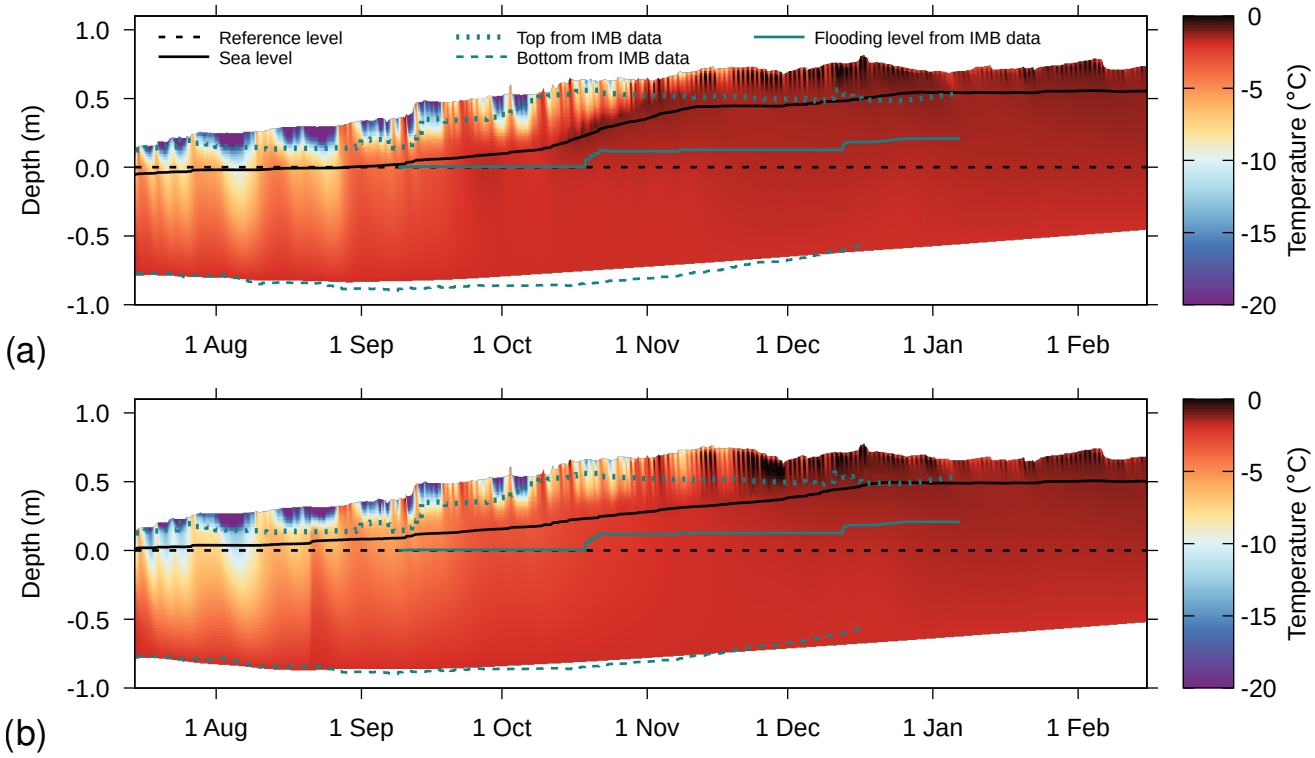

Figure S7: Temperature as simulated by the one-dimensional simulations for the IMB buoy installed at ice station PS81/506 for (a) default setup with bulk salinity of 1.75 g kg^{-1} for layers below sea level and (b) a perturbed setup with a bulk salinity of 5 g kg^{-1} for those layers. Depth is relative to the initial snow-ice interface, which is indicated by a dashed black line. Sea level is denoted by a solid black line, and the sea ice top, flooding level and sea ice bottom determined from the IMB data are shown by a dotted, solid, and dashed cyan line, respectively.

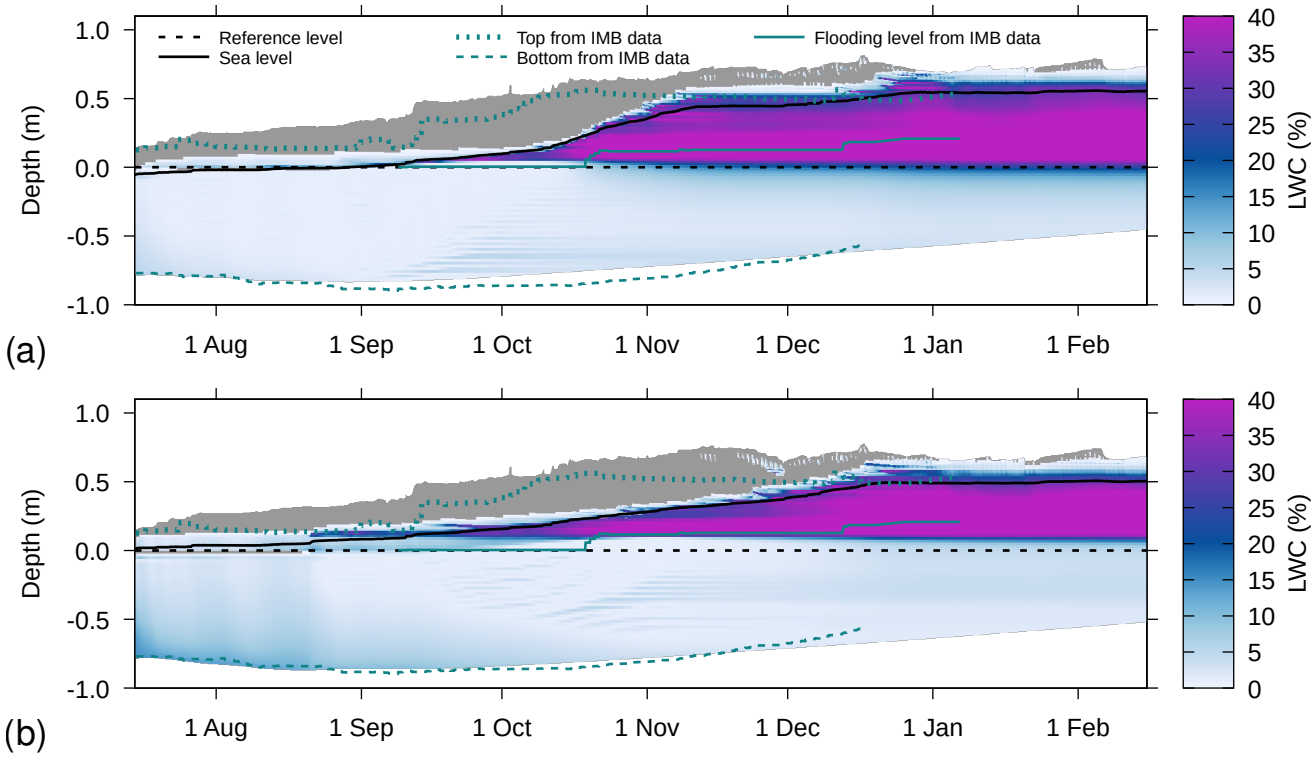

Figure S8: Volumetric liquid water content (LWC) as simulated by the one-dimensional simulations for the IMB buoy installed at ice station PS81/506 for (a) default setup with bulk salinity of 1.75 g kg^{-1} for layers below sea level and (b) a perturbed setup with a bulk salinity of 5 g kg^{-1} for those layers. Depth is relative to the initial snow-ice interface, which is indicated by a dashed black line. Sea level is denoted by a solid black line, and the sea ice top, flooding level and sea ice bottom determined from the IMB data are shown by a dotted, solid, and dashed cyan line, respectively. Dry snow is colored grey.

References

Hintze JL and Nelson RD (1998) Violin plots: A box plot-density trace synergism. *Am. Stat.*, **52**(2), 181–184 (doi: 10.1080/00031305.1998.10480559)