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Improved determination of the precipitation phase

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To separate between rain and snow is important for many hydrological modeling applications (e.g. rain and melt-water runoff, soil frost formation, polar/glacial ice accumulation/ablations etc.) at the same time as the number of manual observations of the phase is decreasing. Particularly important is accurate phase assessment in climates where the surface air temperature oscillates around zero for long periods. Phase accuracy in hydrological models can be improved by combining hydrological and meteorological approaches, still using only surface observations. Most hydrological models determine the snow fraction based on daily average surface air temperatures. These methods assumes that the atmospheric conditions acting on the hydrometeors passing through the lower atmosphere are unimportant, ignoring differences in phase probability caused by e.g. latent heat transfers between air and hydrometeors. Including changes in lower atmospheric conditions caused by passing air mass boundaries or surface humidity and shortening the modeling time-step from daily to hourly have been shown to decrease modeled rain/snow errors. Other promising approaches to reduce modeling errors are to utilize differences in precipitation rate/duration and seasonal/terrain dependent lapse rates.