The Effect of Snowpack Warming on the Stress Bulb Below a Skier

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Skier induced stresses are believed to penetrate deeper into the snow pack with increasing snow temperatures, and hence initiation of a fracture in a weak layer becomes more likely. To date, no measurements exist to quantify or validate the temperature effect on the stress bulb below a skier. In this study we present first results of two-dimensional measurements of the skier induced stress distribution. Thin, 5 x 5 cm, capacitive pressure sensors were placed in a snow pit wall below a standing skier. To factor in the effect of temperature changes, the measurements were conducted before and after one to two-day warming periods. Increasing temperatures of the near-surface layers altered the shape of the stress bulb, but so far we have not observed a substantial increase in depth. In some cases, warming and softening of the near-surface layer resulted in deeper ski penetration and stronger bending of the ski, distributing the skier's weight over a longer distance. Therefore, the stress bulb lengthened, but did not gain in depth. A widening stress bulb may overcome the critical length necessary to initiate AND propagate a fracture in a weak layer.