

Potential changes in the frequency of rain on snow events for U.S. Cascades ski areas as a result of climate change: projections for Mt. Bachelor, Oregon in the 21st century

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We evaluate how climate change resulting from increased greenhouse gas (GHG) emissions may affect the frequency of rain-on-snow events at Mt. Bachelor in the years 2030, 2075 and 2100. Snow coverage was evaluated using the Snowmelt Runoff Model. We estimated climate changes (temperature and precipitation) using MAGICC/SCENGEN and the output from ten General Circulation Models. We bracketed potential climate changes by using the relatively low, mid-range, and high GHG emissions scenarios known as B1, A1B, and A1FI.

Temperatures at Mt. Bachelor are estimated to increase 0.8 to 1.7°C by 2030, 1.6 to 5.6°C by 2075, and 1.9 to 7.4°C by 2100. The snowline is estimated to rise above the base area elevation (1,671m) to an elevation of 2,000 m under the A1FI scenario in 2075. In 2100, the snowline is estimated at an elevation of 2,400 m under the A1B scenario and 2,800 m under A1FI. The total number of rain-on-snow events during the ski area operating season is expected to increase a day or two by 2030, and up to seven days by 2075. By 2100, the loss of snowpack reduces the projected number of rain-on-snow events, but the ratio of rain to snow events continues to increase. For any time period and elevation in which a snowpack exists, the frequency of rain-on-snow events is projected to increase by 1.5 to 2.5 times, compared to the same time period under current conditions.