



Slab avalanche dimensions from fracture mechanics and field data

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A method is given based on fracture mechanics to estimate the length and width of fallen snow slabs. The method requires the ratio of mode I fracture toughness in tension in the body of the slab to the mode II fracture toughness in the weak layer. It is shown from slab avalanche field measurements that the ratio varies from about 1 to 10 with a mean value between 5 and 7. Theoretical estimates of slab width and length (crown to stauchwall) are given and compared with several sets of field data on slab dimensions. The results show that, on average, the length is about 50 times the depth, D , to the weak layer and the width is about 100 times D both from the theory and the field measurements. Data from more than 3000 slab avalanches measured and estimated in the field are compared with the theory including more than 100 skier triggered avalanches. The comparisons show that there are wide variations in dimensions but, on average, the simple theory agrees with the data. A practical method is given to estimate typical or average slab volume given only the depth D to the weak layer. The relation to the Canadian size classification for avalanches is given.