Supplementary Materials for

Evaluation of E3SM Land Model snow simulations over the Western United States

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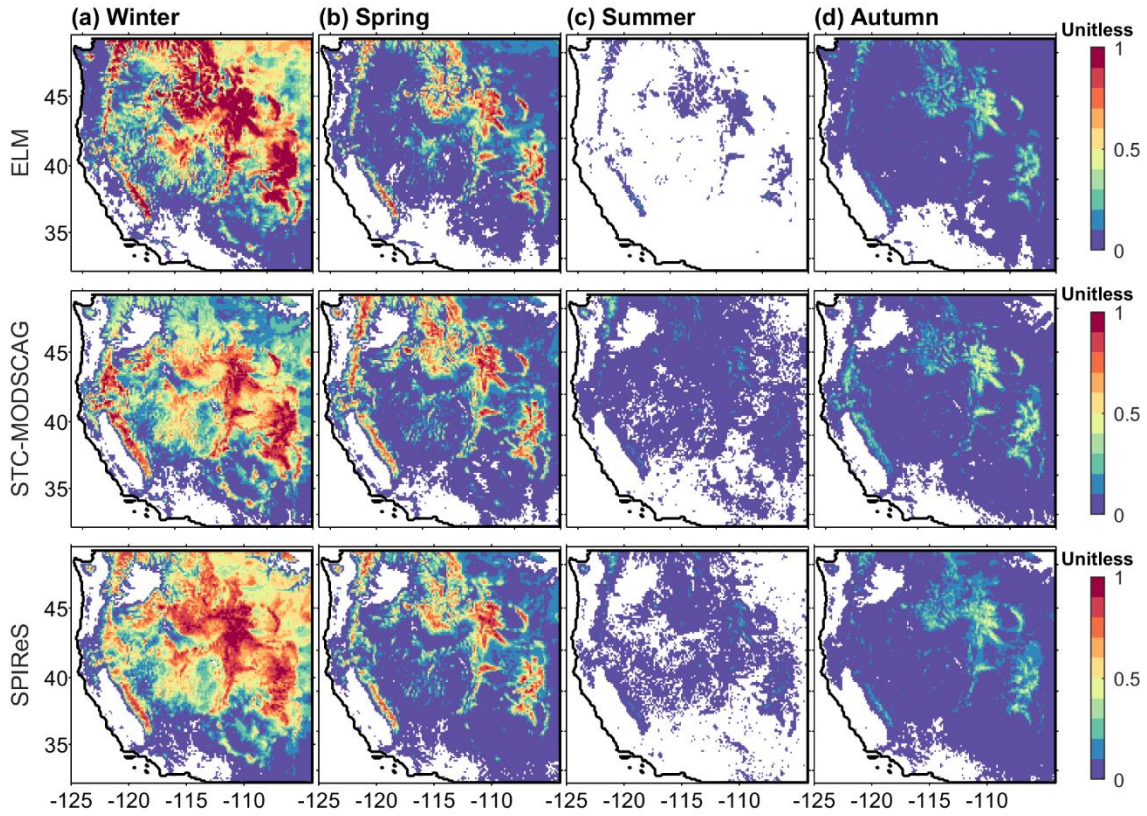

Figure S1: Spatial distributions of snow cover fraction (f_{sno}) in ELM and two remote sensing products (i.e., STC-MODSCAG and SPIReS) for different seasons: (a) winter, (b) spring, (c) summer and (d) autumn. In all panels, regions with no snow cover are masked with white color.

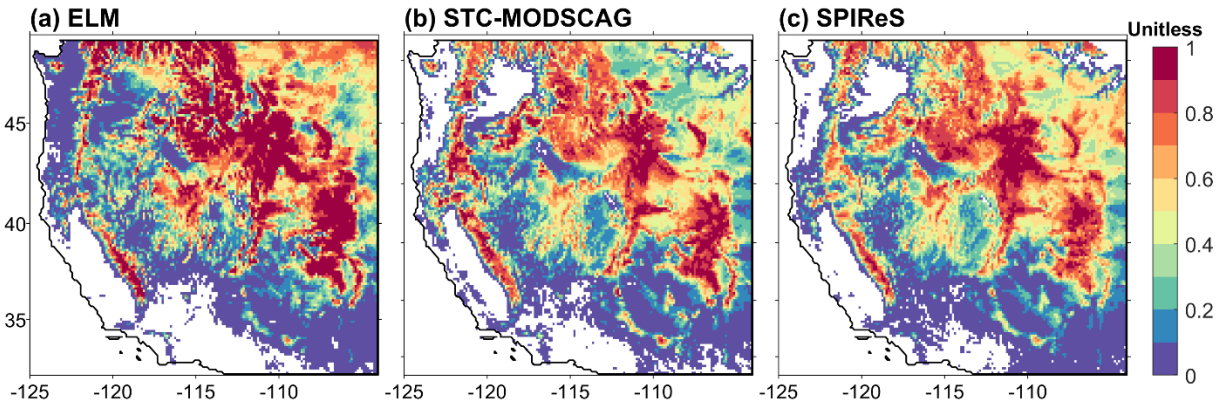

Figure S2: Spatial distributions of snow cover fraction (f_{sno}) in ELM and two remote sensing products (i.e., STC-MODSCAG and SPIReS) for February.

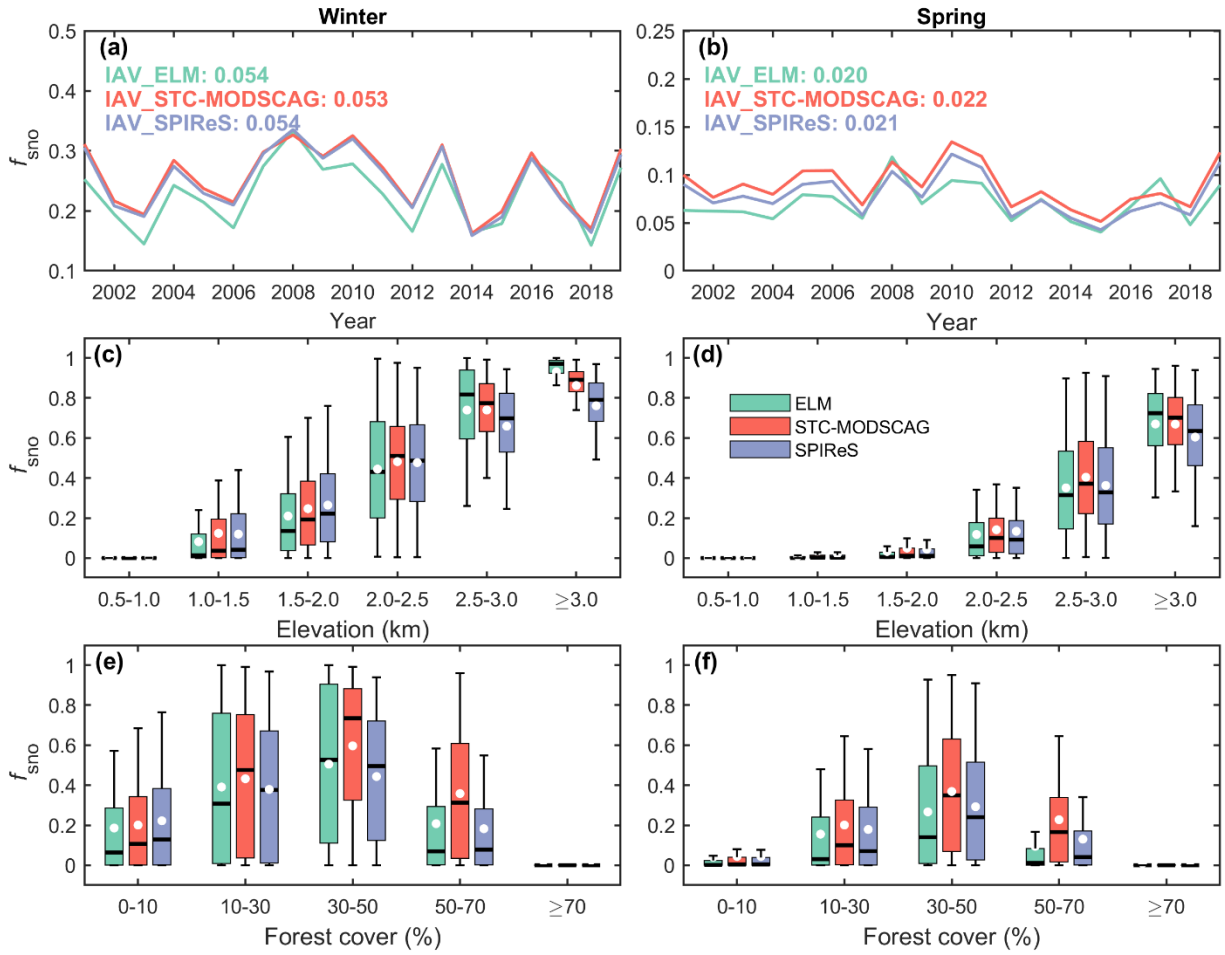

Figure S3: (a,b) Time series of regional average values, (c,d) elevation gradients, and (e,f) change with forest cover of snow cover fraction (f_{sno}) in ELM (green), STC-MODSCAG (red), and SPIReS (blue) over the WUS regions below 42° in latitude. Panels (a,c,e) are for winter and panels (b,d,f) are for spring. In panels (c-f), the white dots represent the average values.

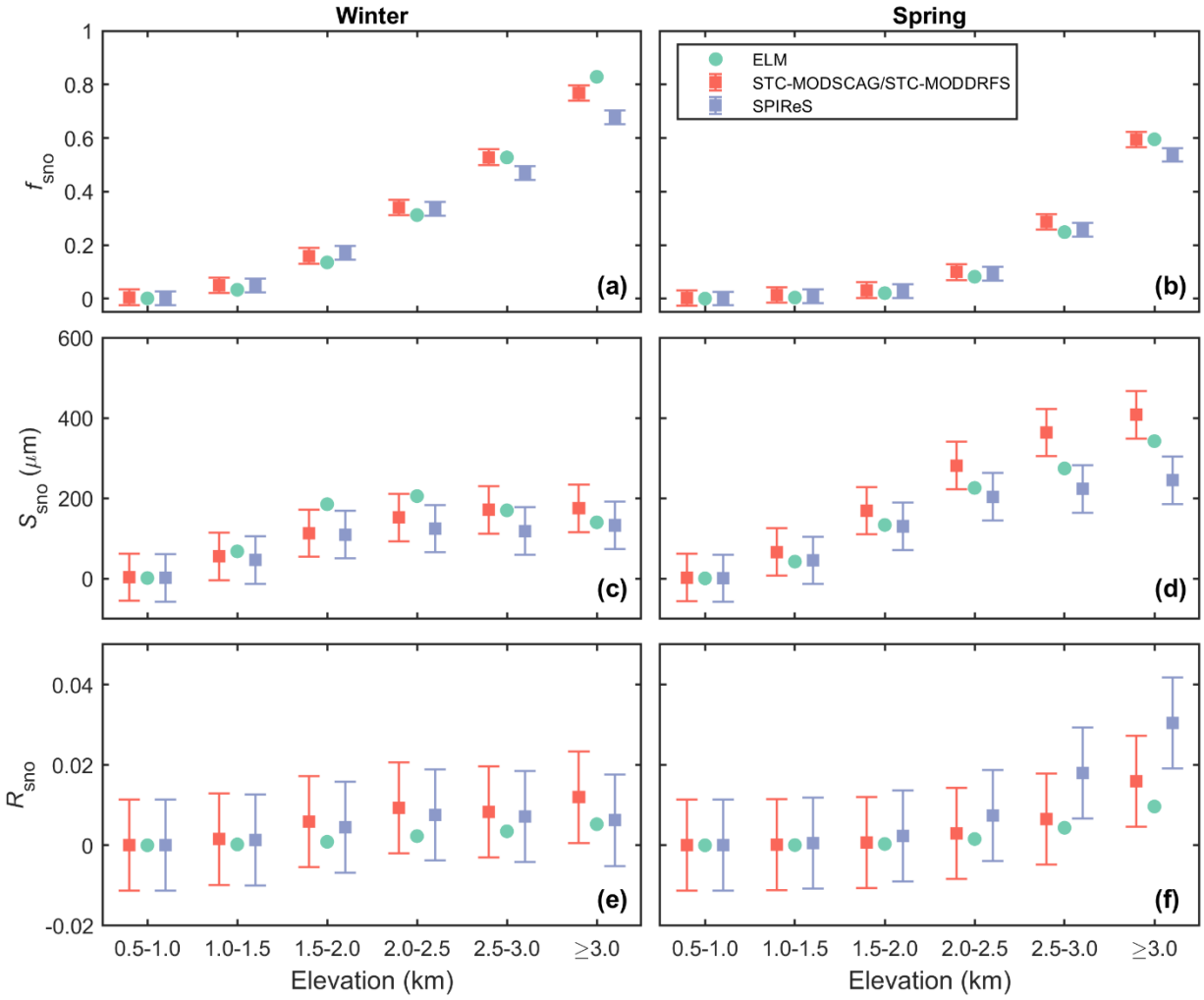

Figure S4: The area-weighted average (a,b) snow cover fraction (f_{sno}), (c,d) snow grain size (S_{sno}) and (e,f) snow albedo reduction (R_{sno}) for (a,c,e) winter and (b,d,f) spring of ELM (green), STC-MODSCAG/STC-MODDRFS (red) and SPIReS (blue) over the WUS regions below 42° in latitude. The bar width represents the uncertainty bounds of STC-MODSCAG/STC-MODDRFS and SPIReS from (Bair et al., 2021a).

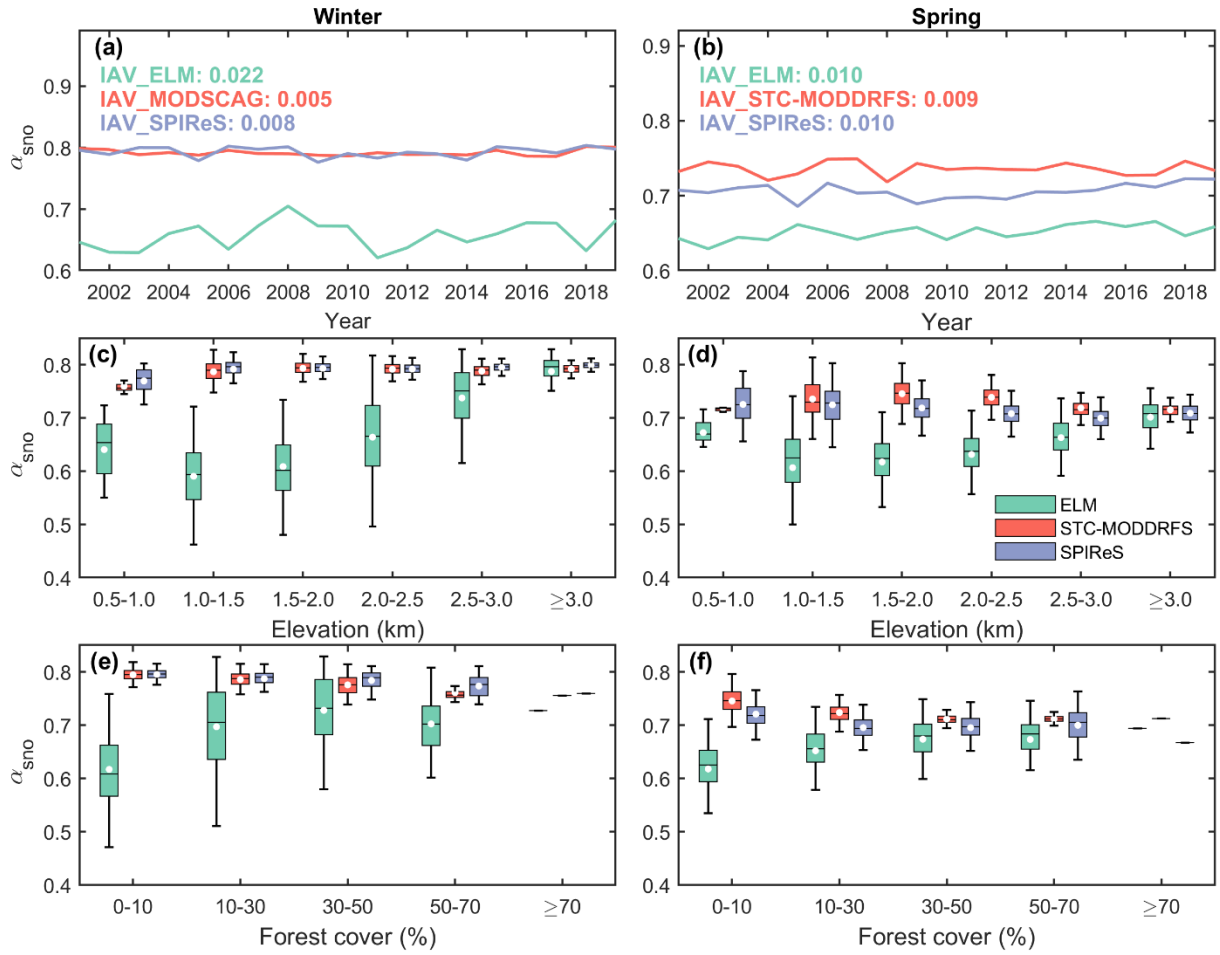

Figure S5: (a,b) Time series of regional average values, (c,d) elevation gradients, and (e,f) change with forest cover of snow albedo (α_{sno}) in ELM (green), STC-MODSCAG (red), and SPIReS (blue) over the WUS regions below 42° in latitude. Panels (a,c,e) are for winter and panels (b,d,f) are for spring. In panels (c-f), the white dots represent the average values.

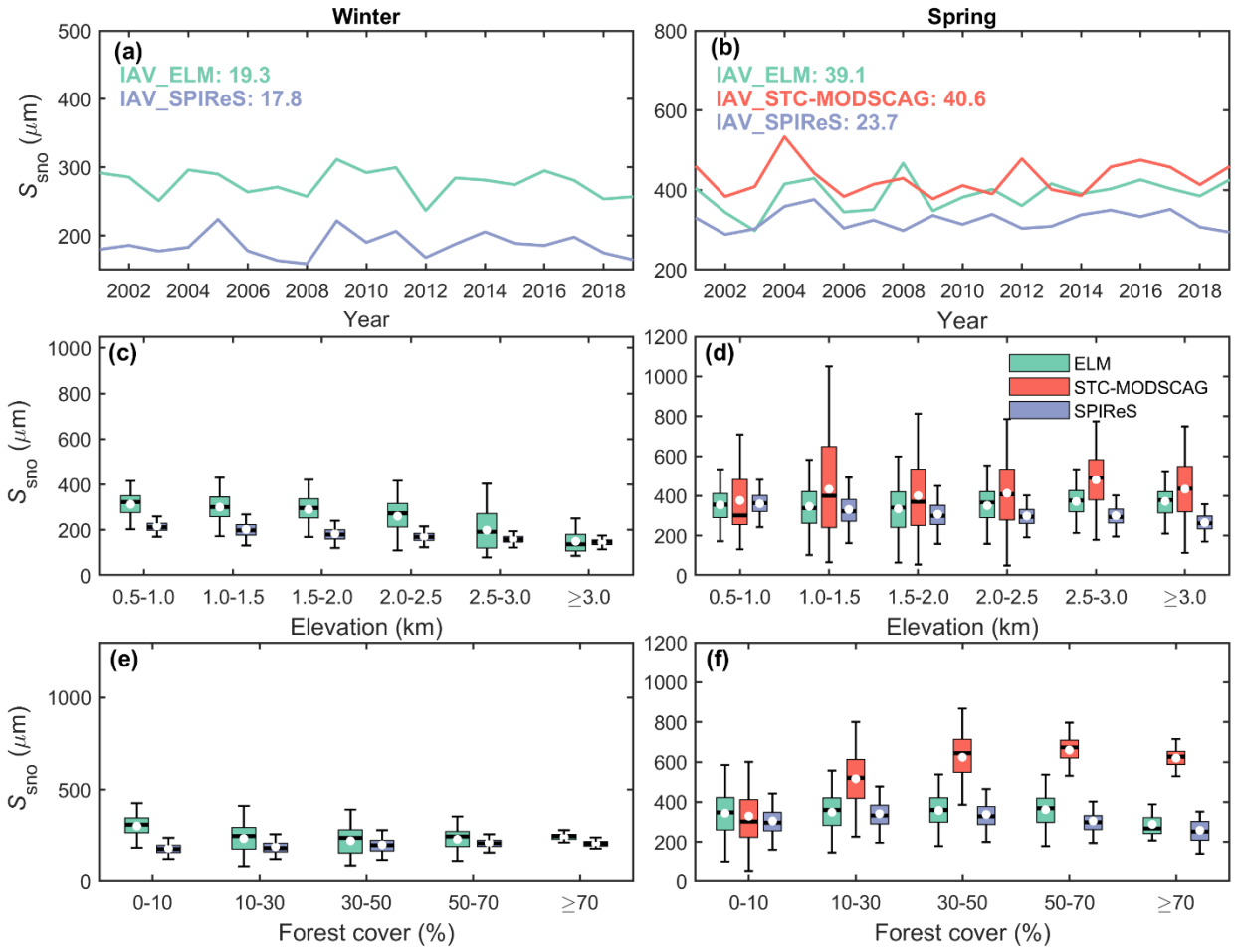

Figure S6: (a,b) Time series of regional average values, (c,d) elevation gradients, and (e,f) change with forest cover of snow grain size (S_{sno}) in ELM (green), STC-MODSCAG (red), and SPIReS (blue) over the WUS. Panels (a,c,e) are for winter and panels (b,d,f) are for spring. In panels (c-f), the white dots represent the average values.

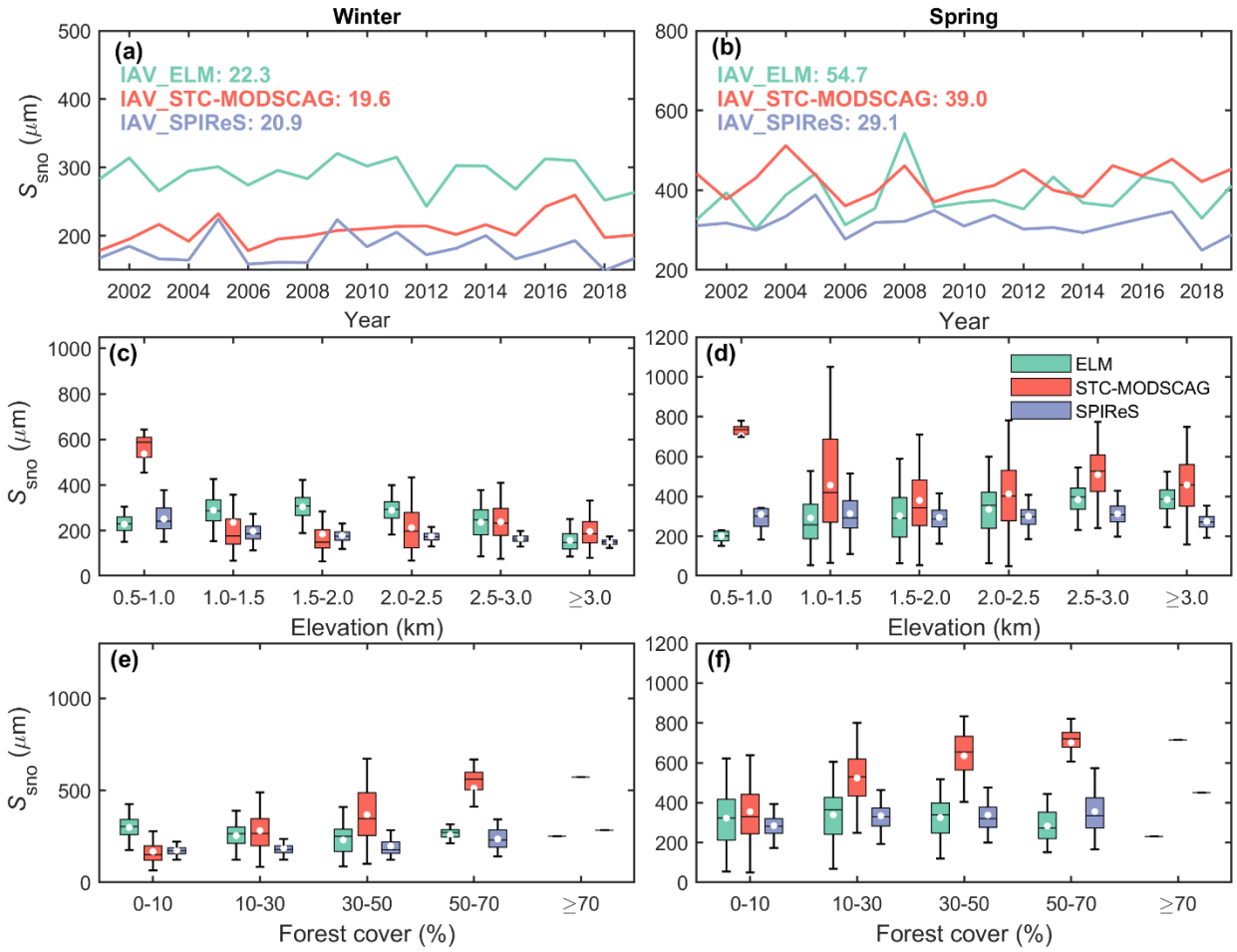

Figure S7: Same as Figure S6, except for the statistics over the WUS regions below 42° in latitude.

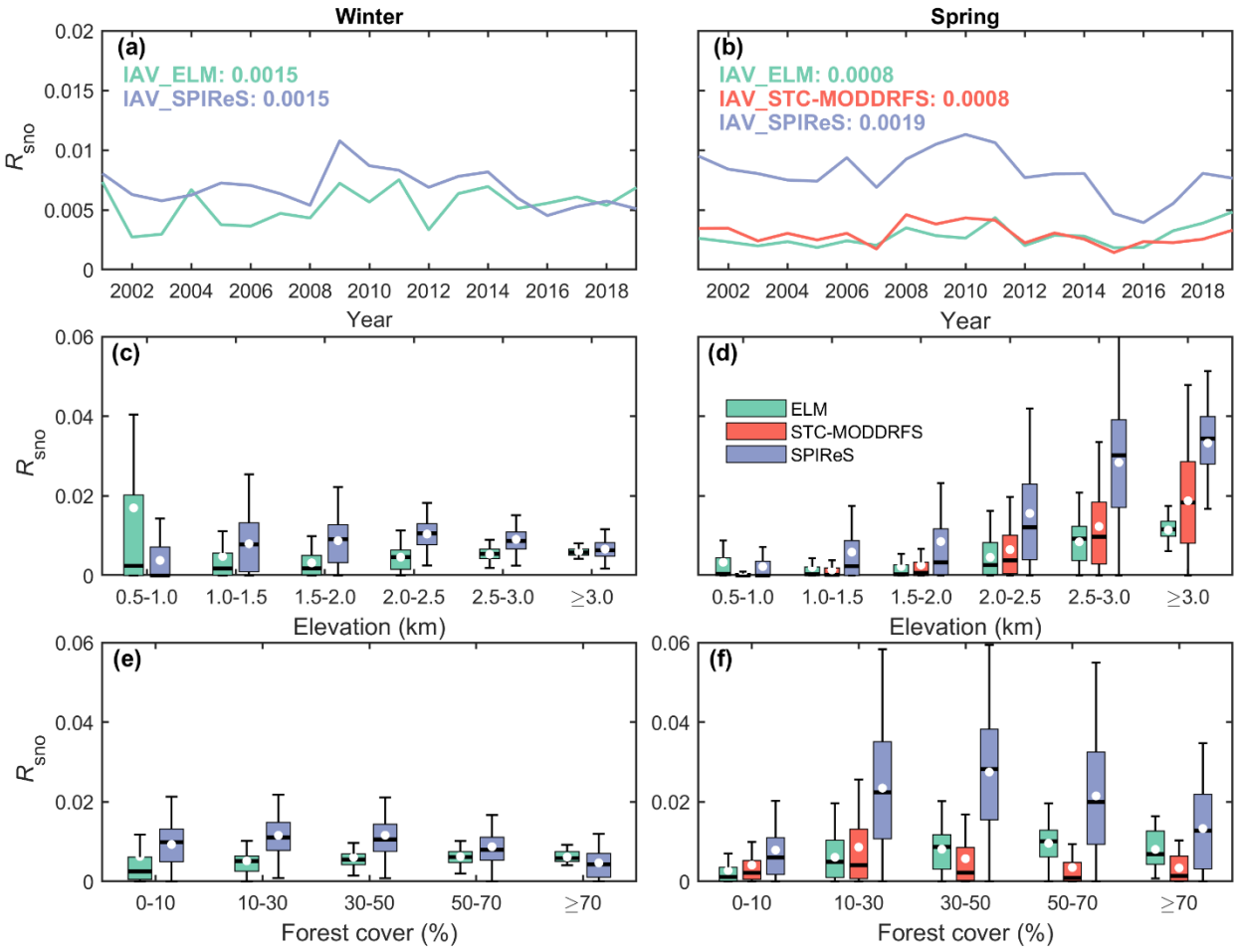

Figure S8: (a,b) Time series of regional average values, (c,d) elevation gradients, and (e,f) change with forest cover of snow albedo reduction (R_{sno}) in ELM (green), STC-MODSCAG (red), and SPIReS (blue) over the WUS. Panels (a,c,e) are for winter and panels (b,d,f) are for spring. In panels (c-f), the white dots represent the average values.

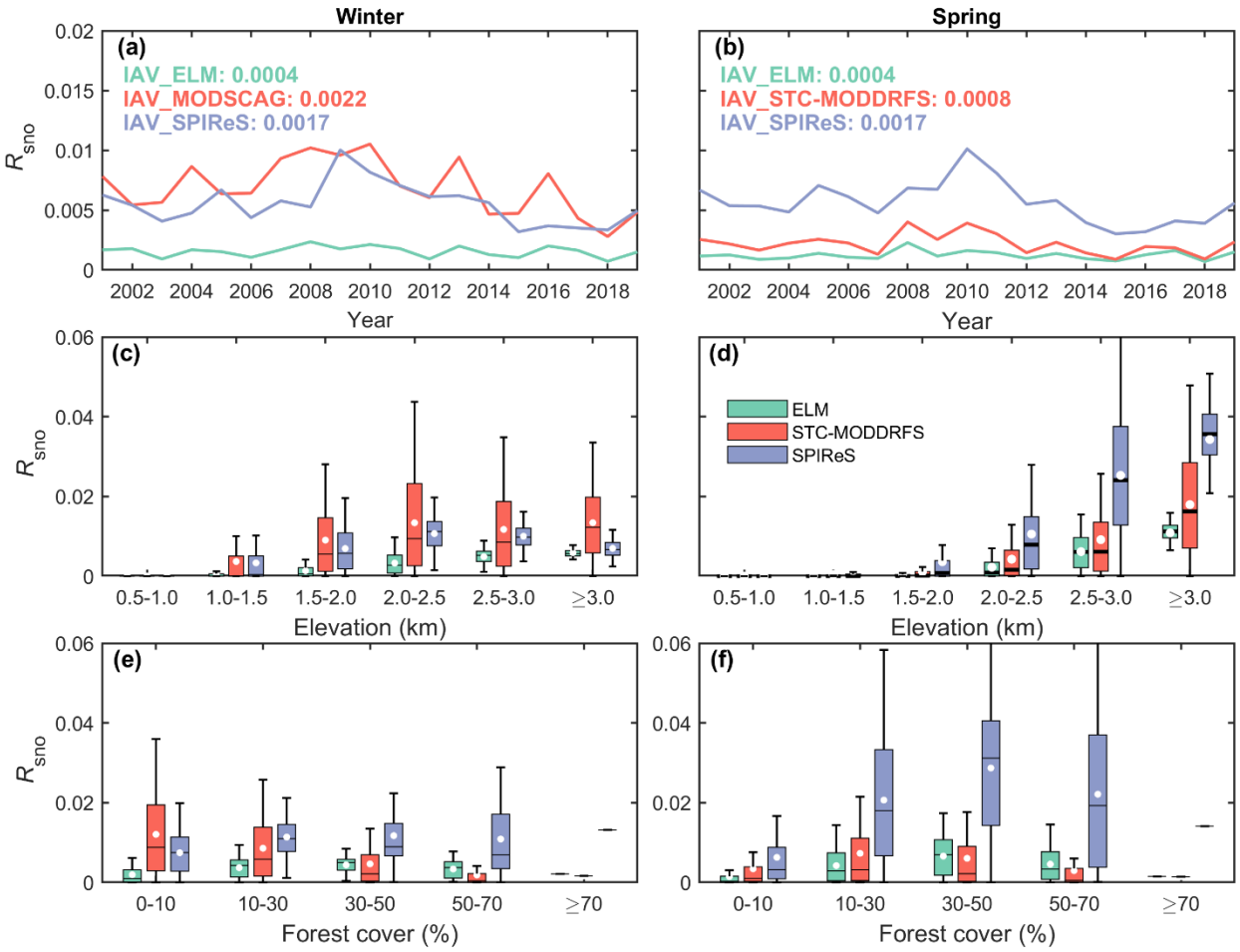

Figure S9: Same as Figure S8, except for the statistics over the WUS regions below 42° in latitude.

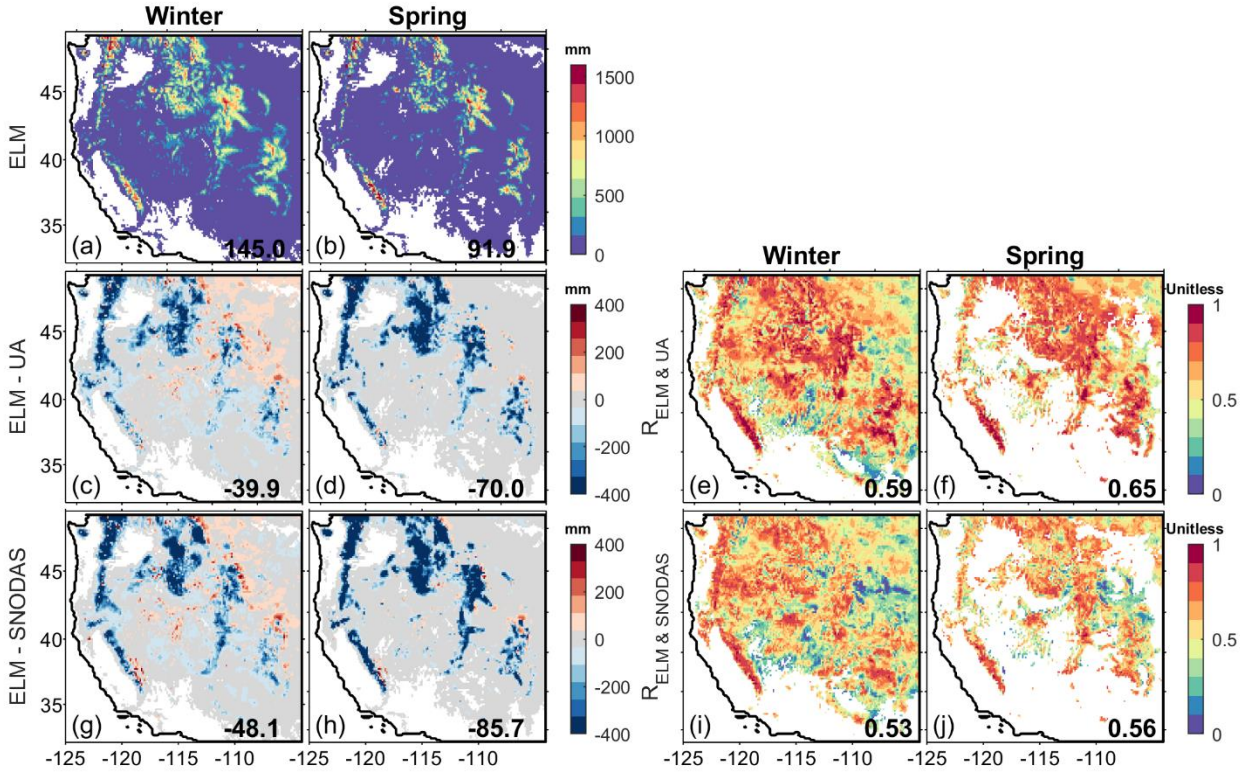

Figure S10: Spatial distributions of (a,b) D_{sno} in ELM and (c,d,g,h) the snow depth (D_{sno}) difference between ELM and two remote sensing products (i.e., MODSCAG and SPIReS) and (e,f,i,j) their temporal correlations (Rs) for different seasons: (a,c,e,g,i) winter and (b,d,f,h,j) spring. In all panels, regions with no snow cover are masked with white color. The area-weighted average values are labelled in each panel.

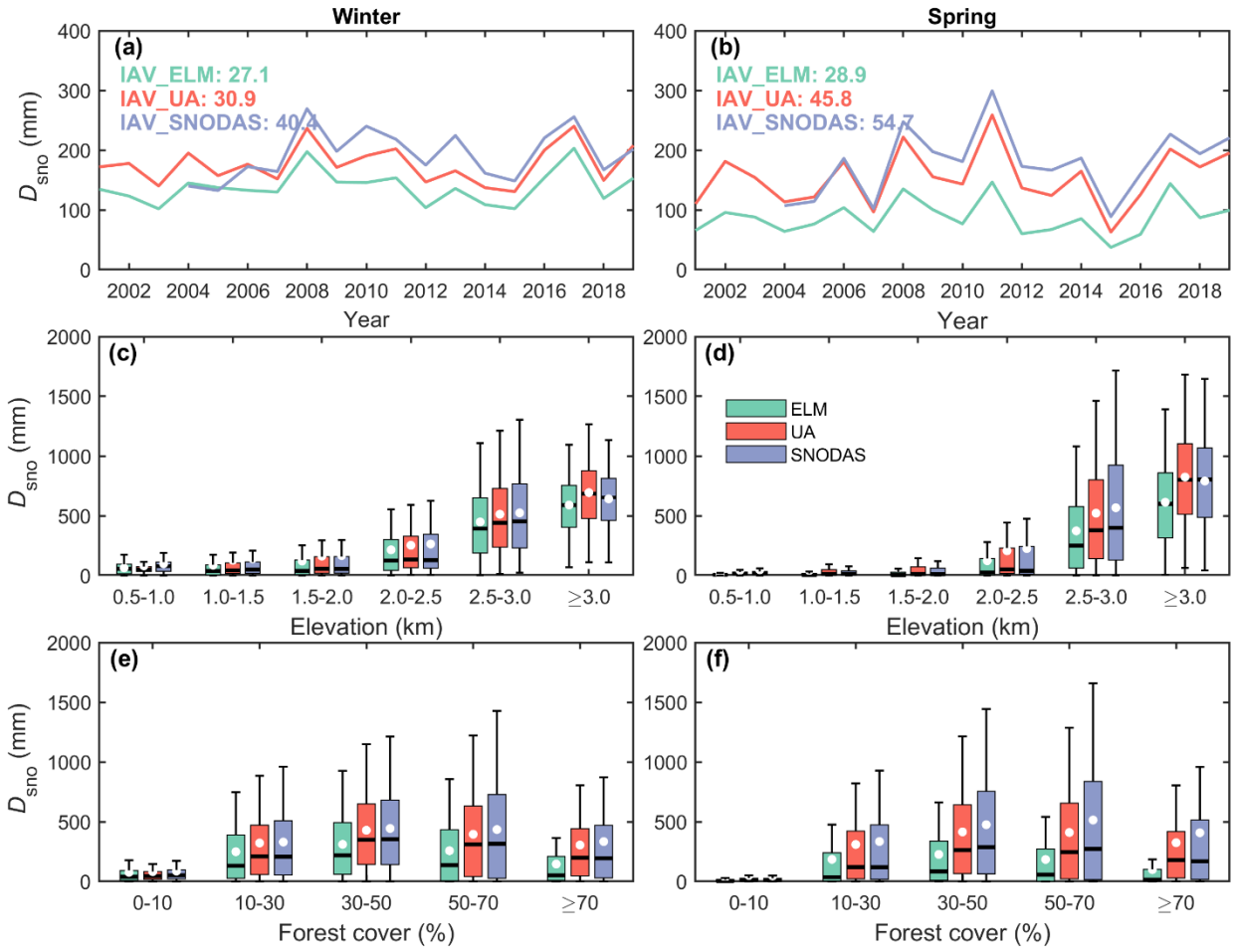

Figure S11: (a,b) Time series of regional average values, (c,d) elevation gradients, and (e,f) change with forest cover of snow depth (D_{sno}) in ELM (green), UA (red), and SNODAS (blue) over the WUS. Panels (a,c,e) are for winter and panels (b,d,f) are for spring. In panels (c-f), the white dots represent the average values.