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Characterizing structural changes of the stratospheric residual circulation in future climates

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Nearly all models project that the meridional overturning of the stratosphere will strengthen in the next century as a response to anthropogenic forcing. The most accepted mechanism for what drives the change focuses on an upward shift of the tropospheric circulation in response to global warming. This strengthens the upper flanks of the subtropical jets, which pushes critical layers upward and allows more wave activity to penetrate into the lower stratosphere, hence driving an upward shift in the circulation in response to anthropogenic forcing. Here, using eight CCMVal-2 models we remove the change in the circulation associated with a vertical shift, allowing us to focus on “structural” changes in the wave driving. While the remaining changes differ between models, they do exhibit significant meridional structure which can be connected to meridional shifts in the wave driving and potential vorticity gradients. We interpret these differences as changes in the extent of the surf zone.