

Anmeldung eines Themas für eine Bachelorarbeit

Thema Datum	Unsupervised clustering of the middle-atmosphere
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Kurzbeschreibung:	<p>One of the first studies focused on unsupervised clustering of the stratospheric state is by Coughlin & Gray (2009). Similarly to Christiansen (2010), they found a bimodal structure of the stratosphere, i.e. undisturbed or disturbed states. They suggested that there is no difference between types of sudden stratospheric warmings (SSWs) in terms of their manifestation (continuum of SSWs). However, Coughlin & Gray (2009) used only zonally averaged quantities and k-means clustering has its own limitations compared to other more sophisticated algorithms. Although algorithms such as the k-means clustering are fast and simple, their functionality is limited in high-dimensional spaces due to the curse of dimensionality (Bellman, 1961). The aim of this thesis is to use objective, nonlinear and unsupervised methods allowing to embed the high-dimensionality of the middle atmosphere during the wintertime period. One of this method such as self-organizing maps (Kohonen, 1982) may be compared with other methods combining a dimensionality reduction technique with the clustering. The gridded geopotential height – either observational or model data at multiple pressure levels – will be used for the clustering of the middle atmosphere. The embedded states will be discussed in terms of intra-seasonal and longterm variability. The interhemispheric differences may be discussed as well.</p>

Literatur:	<p>Richard Ernest Bellman (1961). Adaptive control processes: a guided tour. Princeton University Press.</p> <p>Christiansen, B. (2010). Stratospheric Bimodality: Can the Equatorial QBO Explain the Regime Behavior of the NH Winter Vortex? <i>Journal of Climate</i>, 23(14), 3953–3966. https://doi.org/10.1175/2010JCLI3495.1</p> <p>Kohonen, T. (1982). Self-organized formation of topologically correct feature maps. <i>Biological Cybernetics</i>, 43(1), 59–69. https://doi.org/10.1007/BF00337288</p> <p>Coughlin, K., & Gray, L. J. (2009). A Continuum of Sudden Stratospheric Warmings. <i>Journal of the Atmospheric Sciences</i>, 66(2), 531–540. https://doi.org/10.1175/2008JAS2792.1</p>
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