

thundeR - a rawinsonde package for processing convective parameters and visualizing atmospheric profiles

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What is thunder?

Thunder is a freeware R language package for skew-t and hodograph visualization, and rapid computation of convective parameters commonly used in the research and operational prediction of convective storms. It has been developed since 2017 and is constantly updated with new features and parameters following requests from the community and the most up to date research findings.

How does it work?

Core algorithm is based on C++ code seamlessly integrated into the R language within the RCPP library. This solution allows to compute over **200** thermodynamic and kinematic parameters within hundredths of a second per atmospheric profile. Such performance enables to process large numerical datasets such as reanalyses or weather prediction models for the research and operational purposes.

I don't know R, can I still use it?

Yes! An online tool available at **www.rawinsonde.com** allows users to use thunder in visualizing rawinsonde measurements and historical profiles from ERA5 reanalysis since 1950. It allows users to manually specify mixing and altitude of a convective parcel, input a manual storm-motion vector, control plotting of CAPE, CIN, DCAPE and SRH polygons and download raw profile and parameters data in .csv.

Can thunder be applied in severe storm research?

As of May 2023, thunder package has been used in more than 20 peer-reviewed studies. If you need support in processing large rawinsonde or NWP datasets or would like to use our post-processed global ERA5 convective parameters data in your research, let us know and we will try to help!

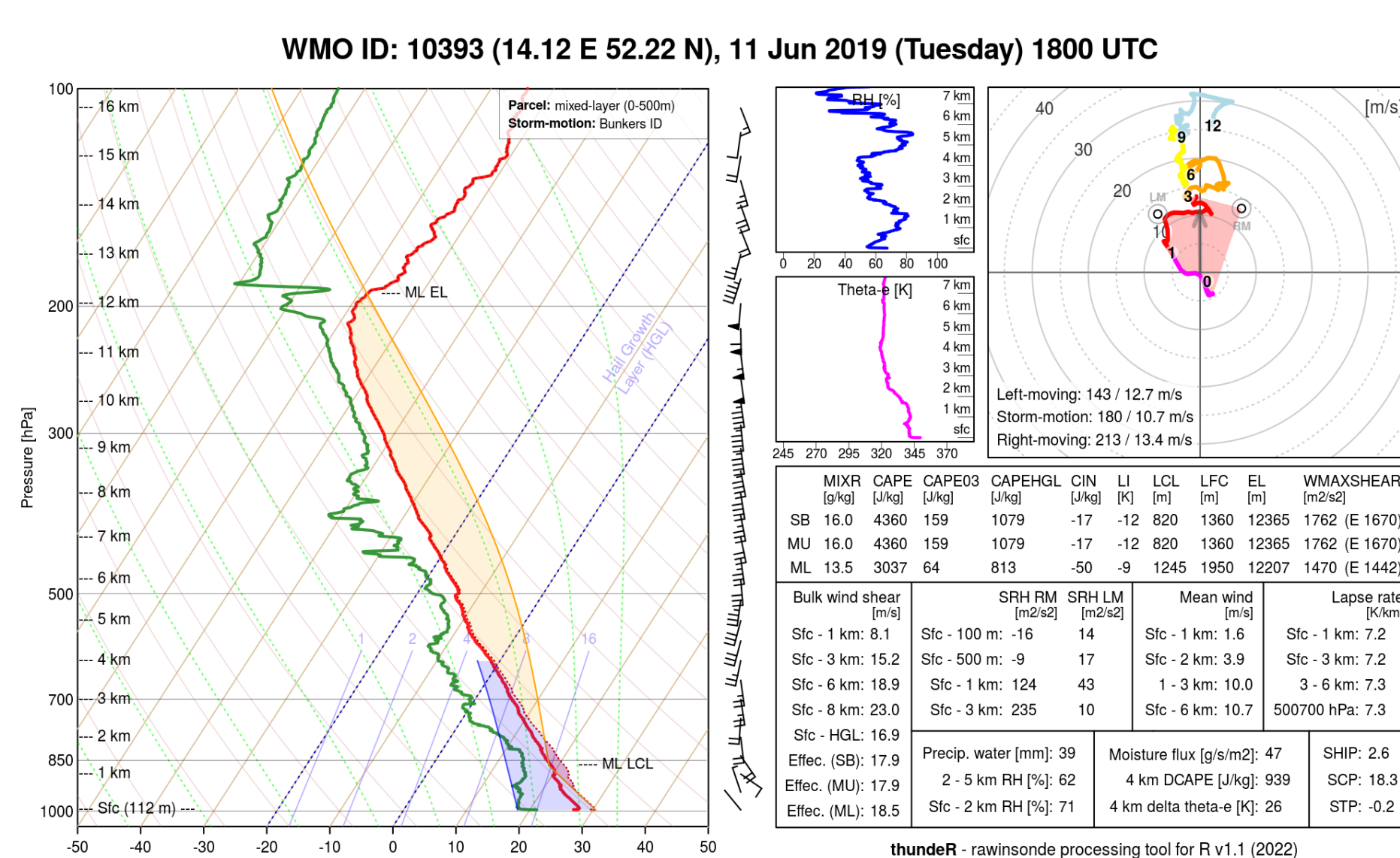
Online sounding browser



Github repository



Available parameters

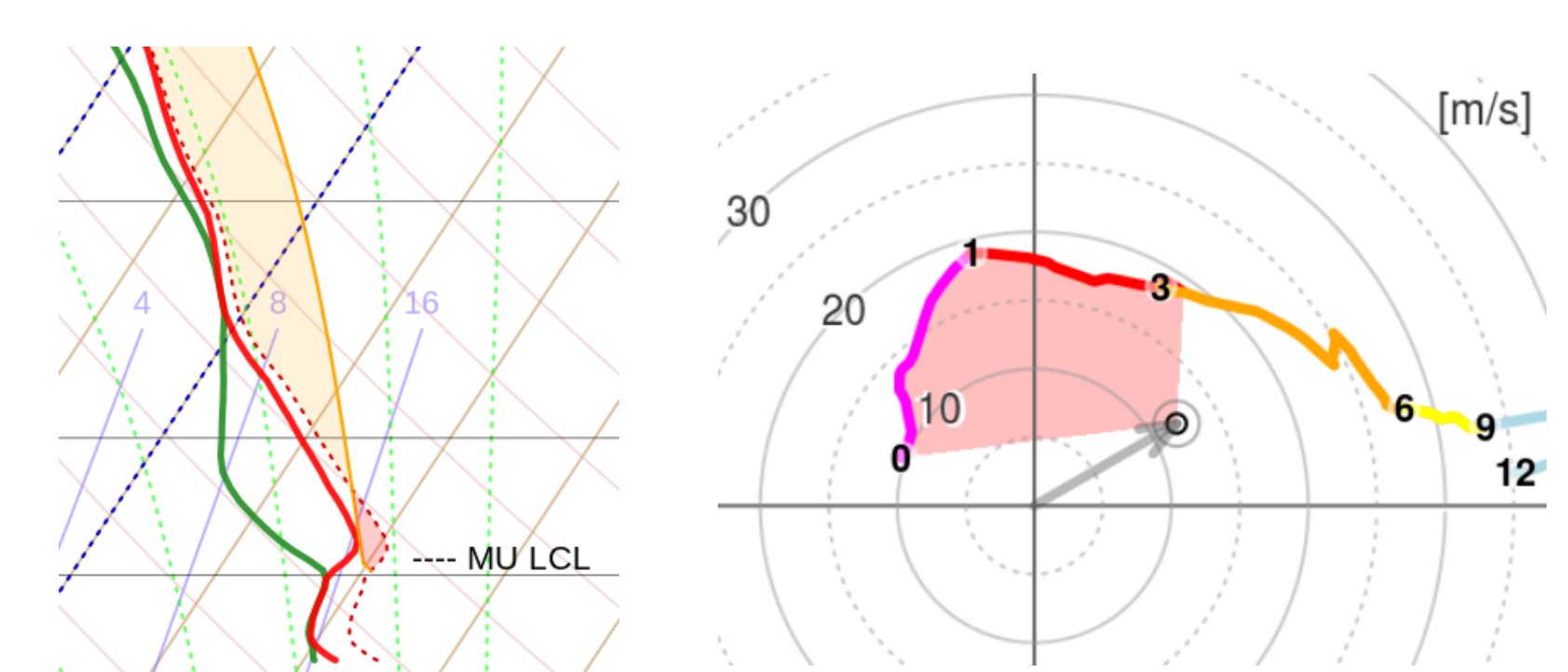
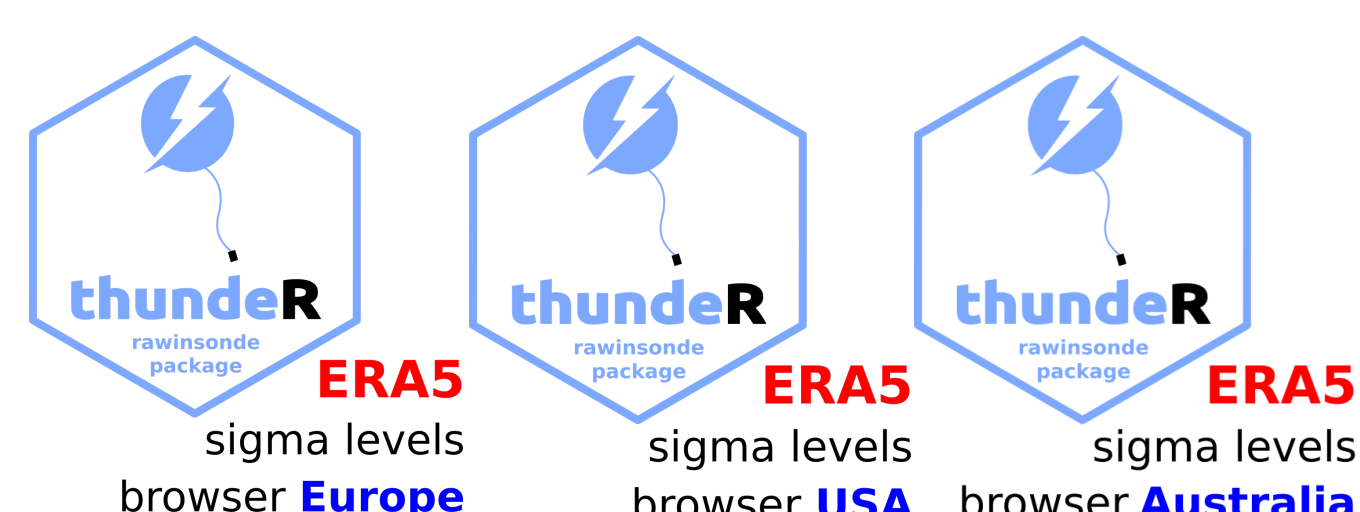


Skew-t and hodograph visualization

200+ convective parameters

No.	Variable	Value	Units
1	MU_CAPE	4360.25	[J/Kg]
2	MU_CAPE_M10	3583.17	[J/Kg]
3	MU_CAPE_M10_PT	2754.45	[J/Kg]
4	MU_02km_CAPE	23.02	[J/Kg]
5	MU_03km_CAPE	159.19	[J/Kg]
6	MU_HGL_CAPE	1079.42	[J/Kg]
7	MU_CIN	-16.95	[J/Kg]
8	MU_LCL_HGT	820.00	[mAGL]

1950+ ERA5 hybrid-sigma historical data browser



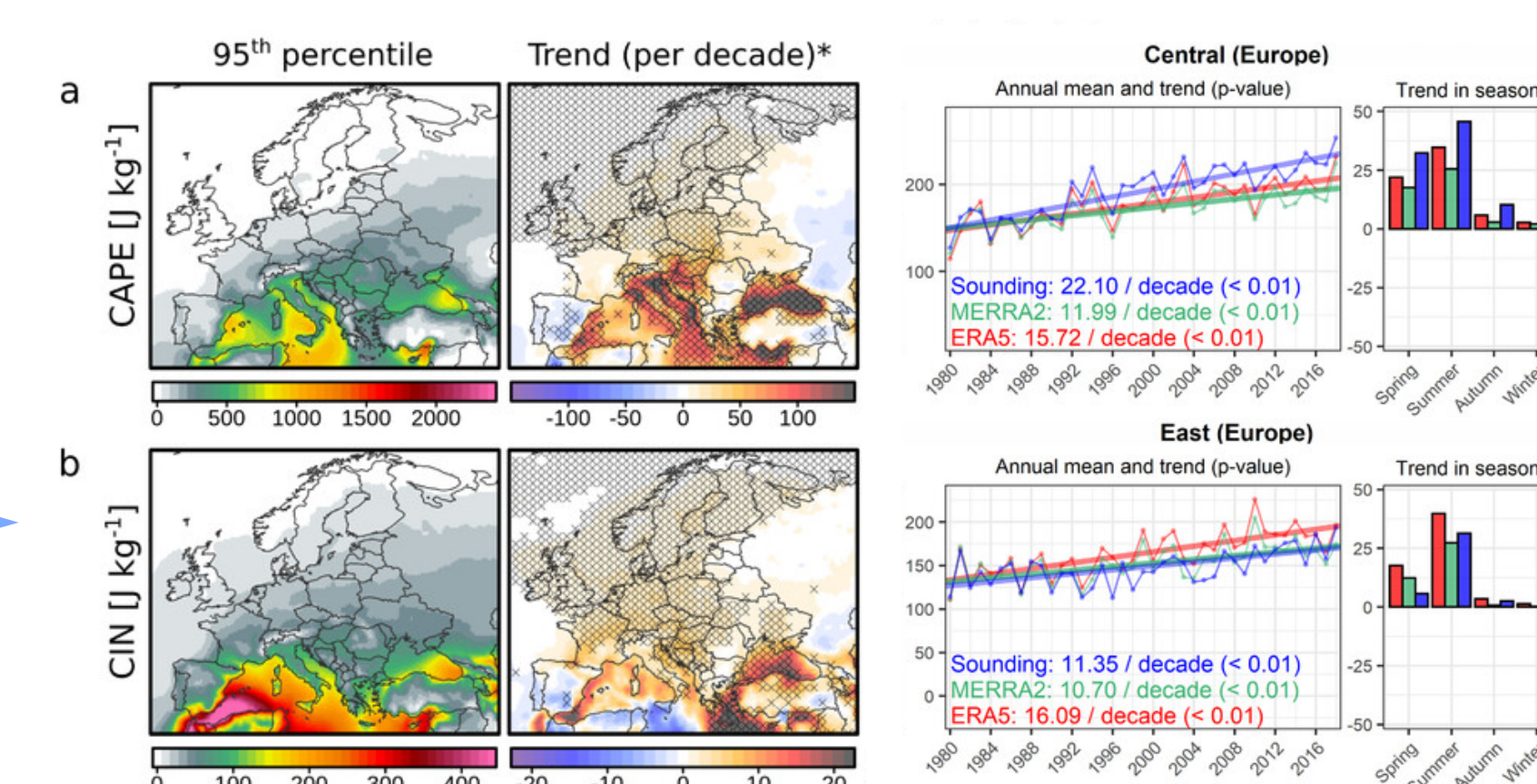
User-defined storm-motion and parcel properties

Parcel curve
Manual-lift 800m

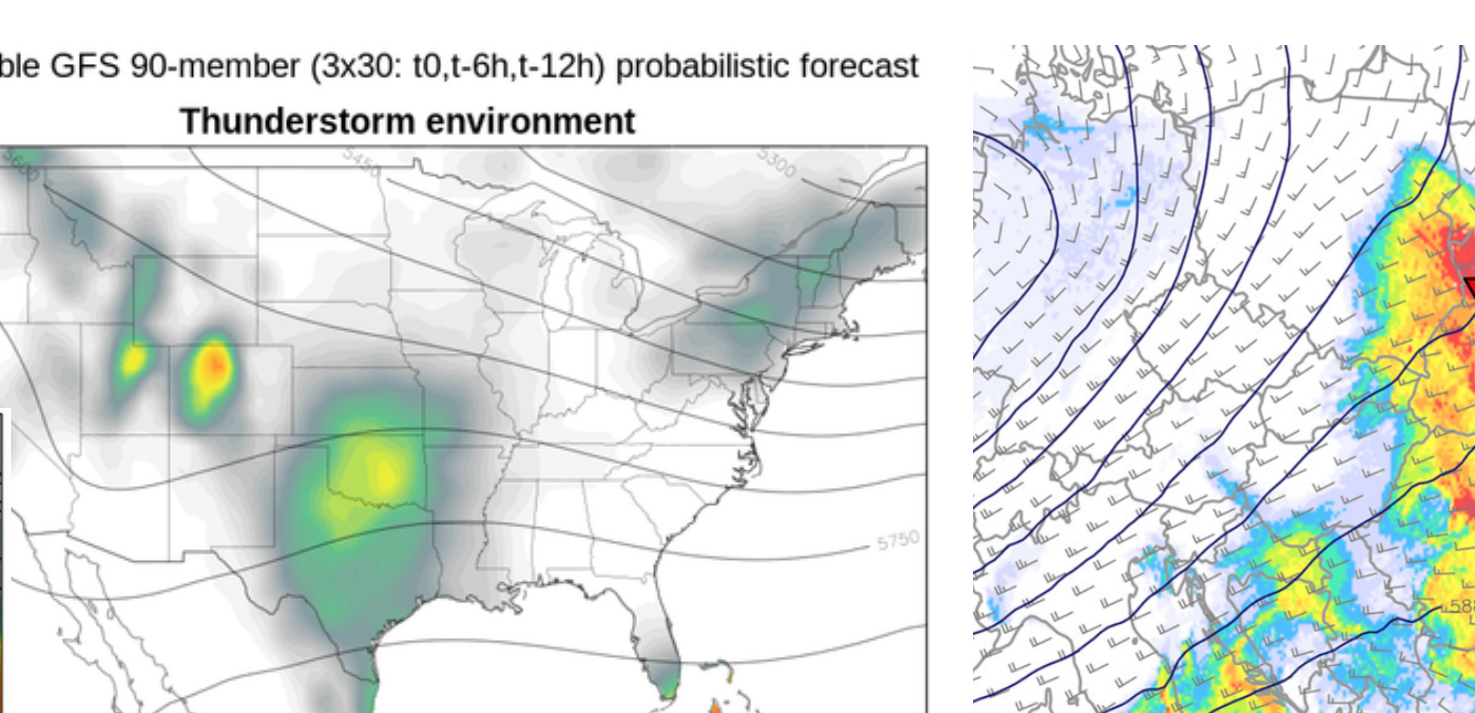
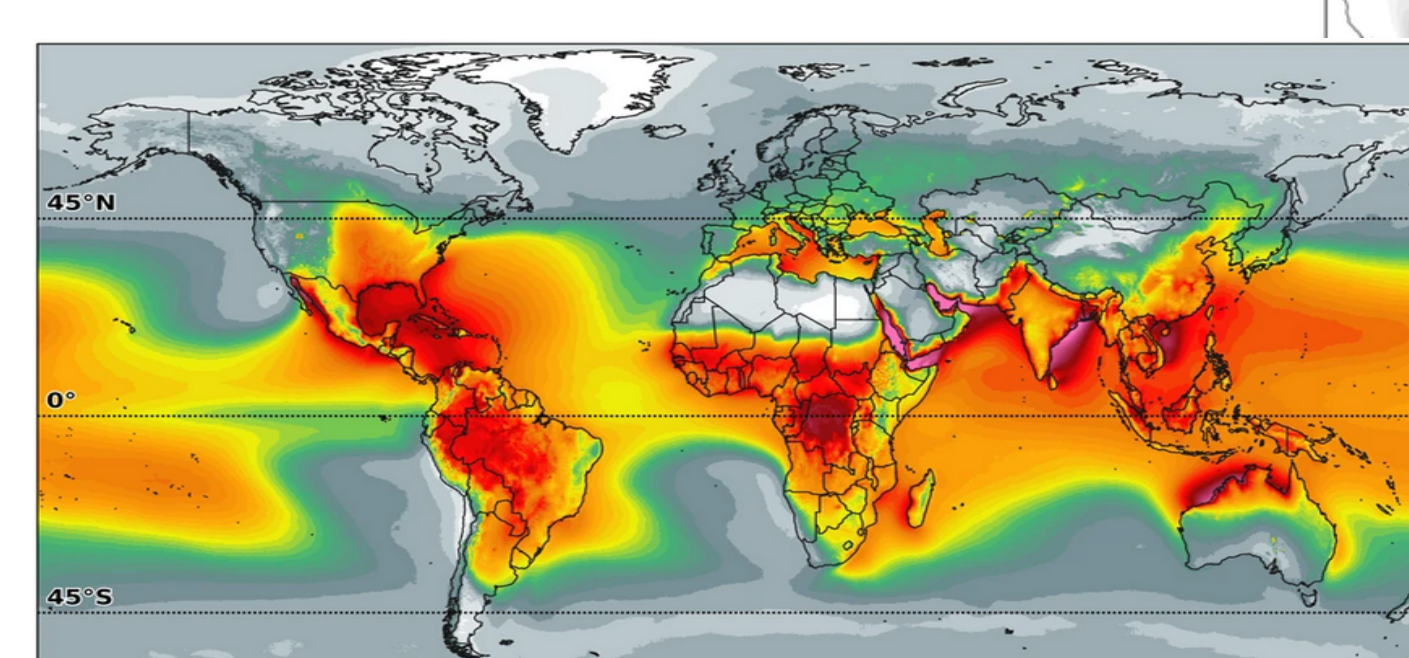
DCAPE area SRH area
no 0-3km RM

Manual storm-motion
Speed Direction
12 m/s 230 °

Generate! (wait several seconds)



Severe storm research



Operational NWP forecast and reanalysis data