Wann kann ich wo und warum einen Rotor erwarten

zusammengeklaut von:

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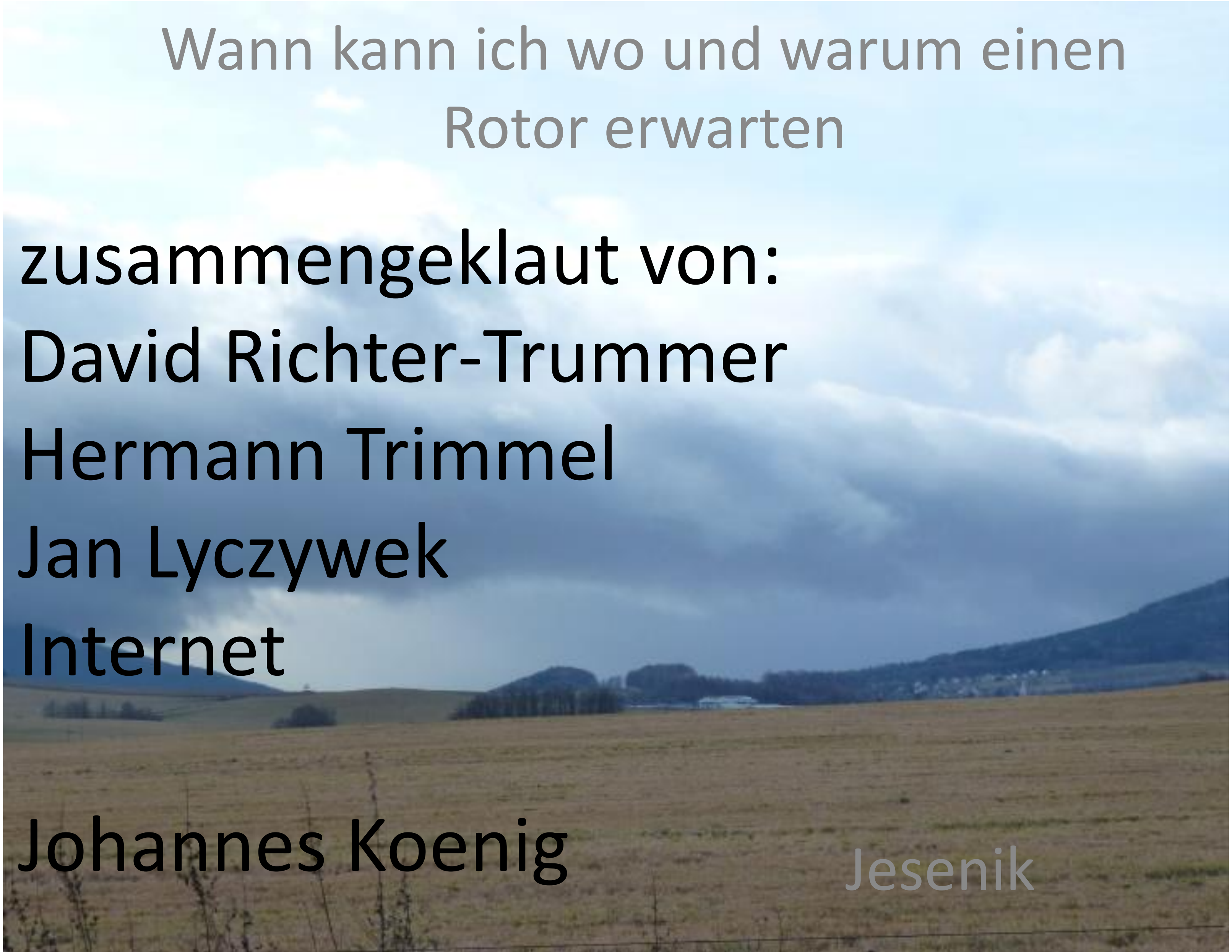
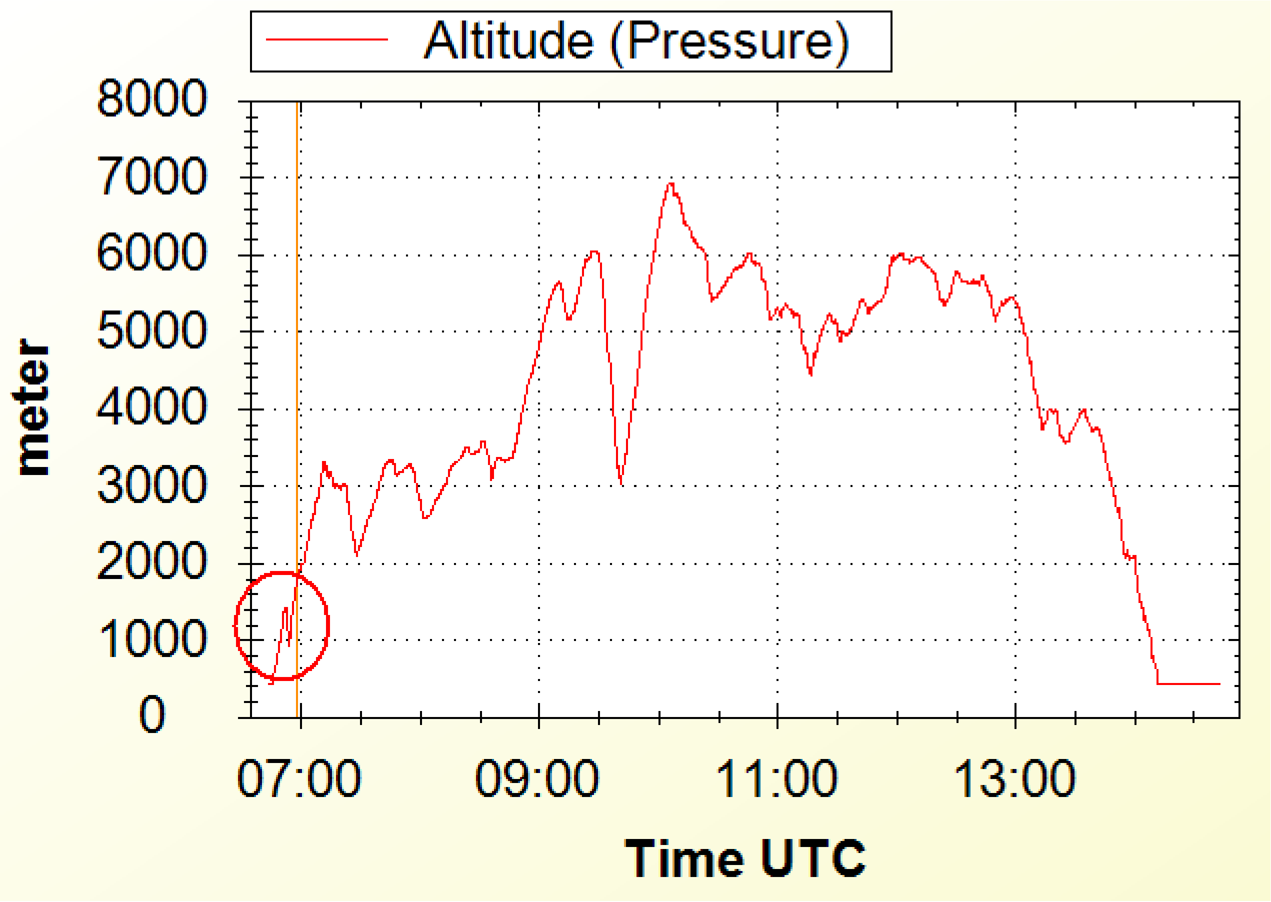
Internet

Johannes Koenig



Motivation

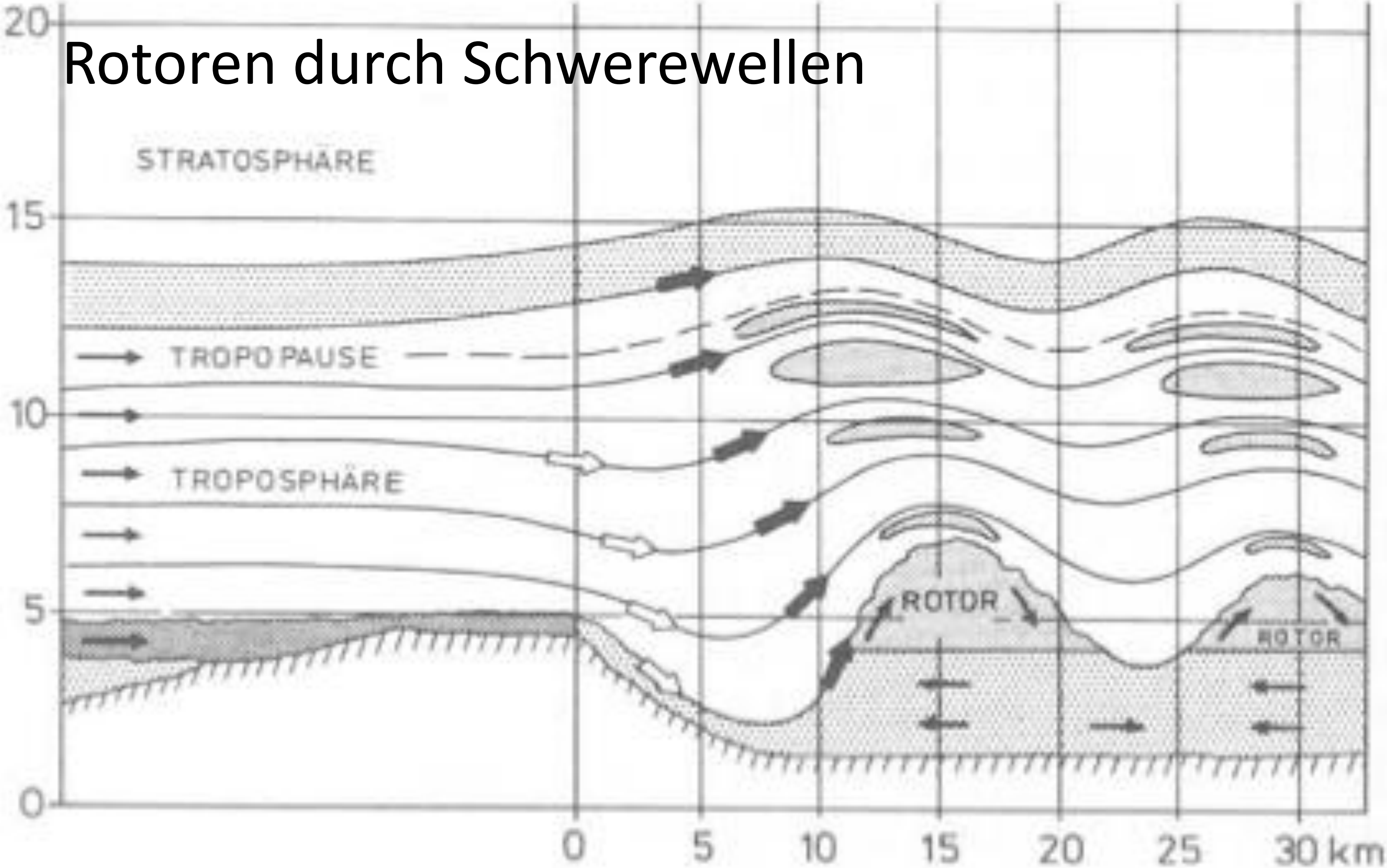


Jesenik

Rotoren sind ungeordnete Strömungen.

Die Bezeichnung unterstellt „Rotation“, die Achse dieser Ordnung soll parallel zur Erdoberfläche angenommen werden.

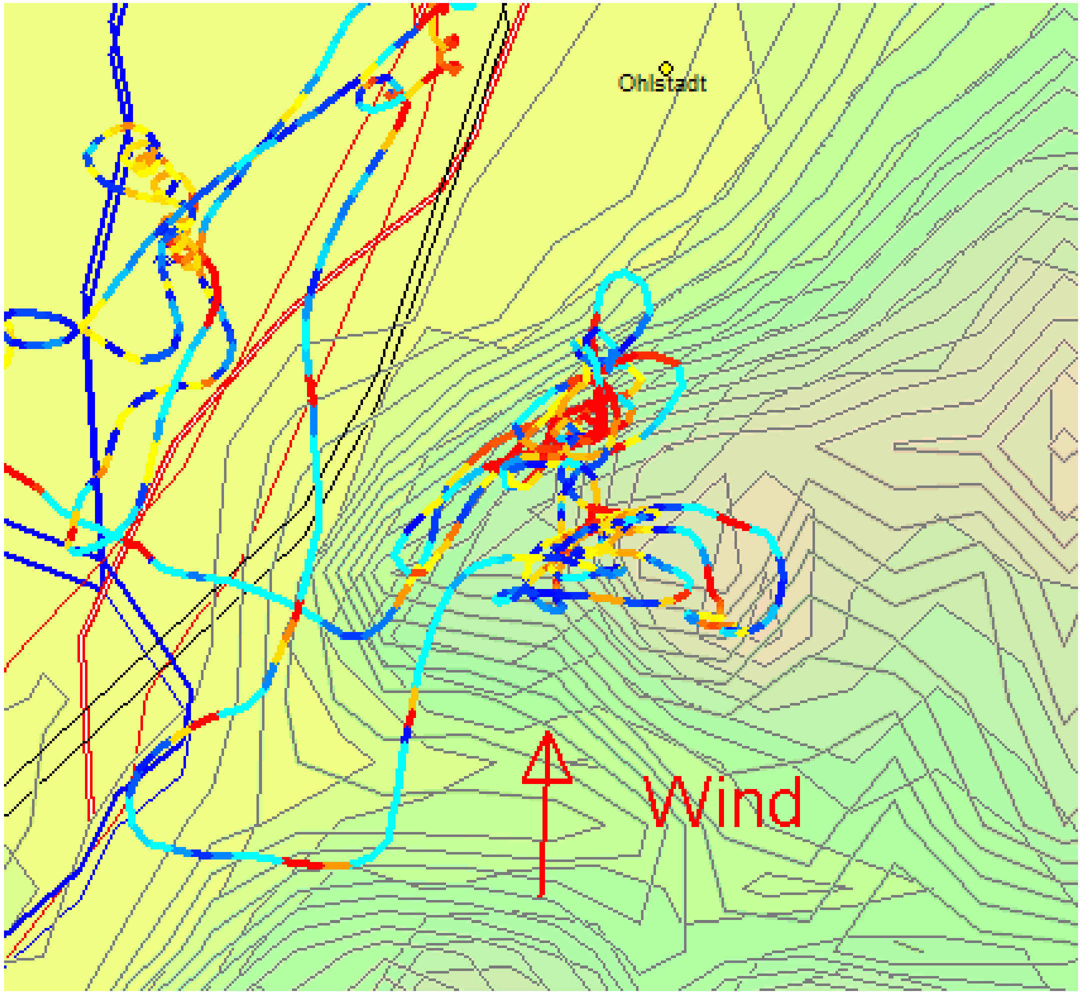
Rotoren durch Schwerewellen



Schema von Leewellen und Rotoren

Rotoren durch Lee Saugwirkung

Rotoren durch „Kehrwind“



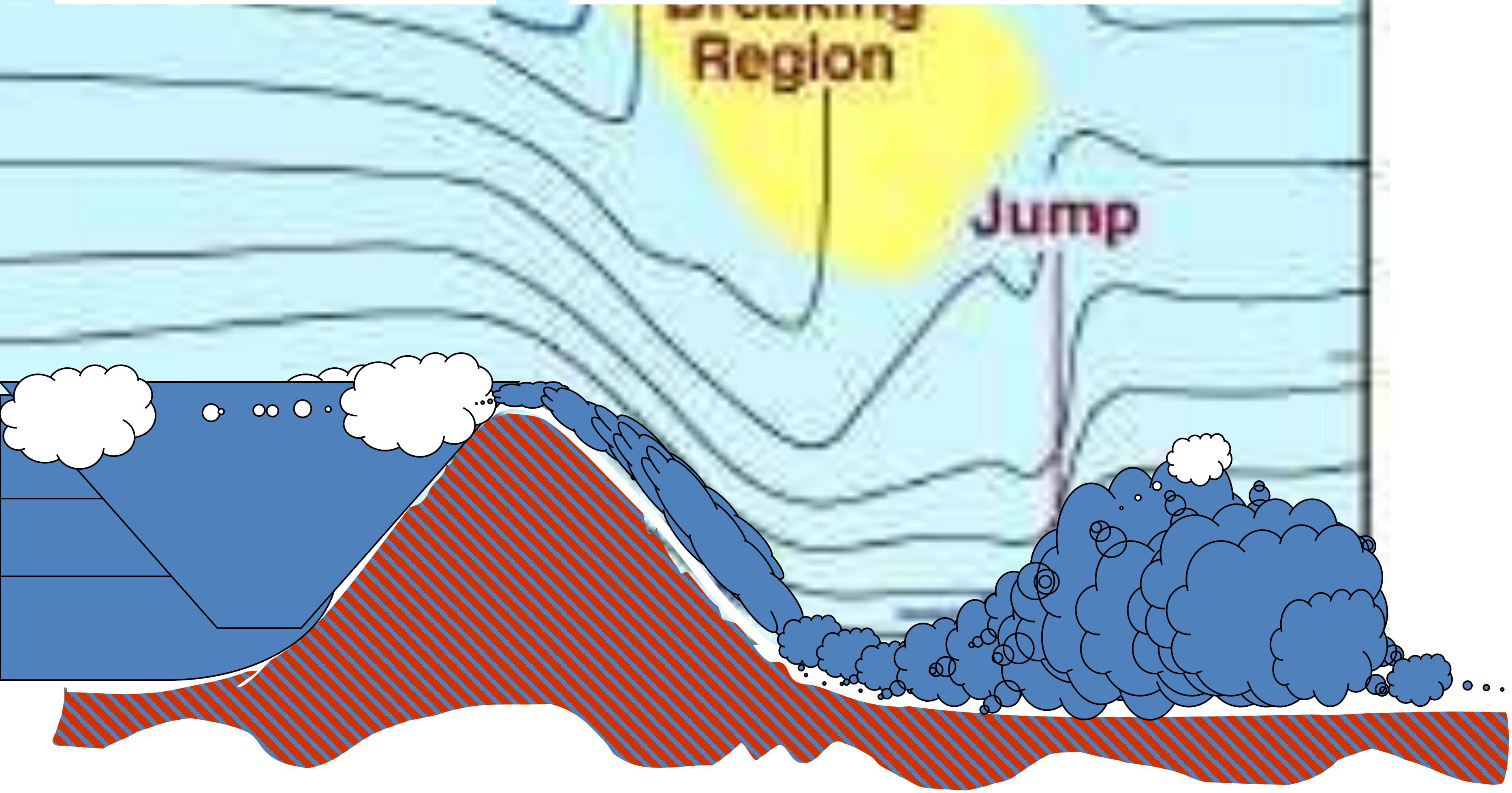
hydraulischer Sprung

Luvseite:

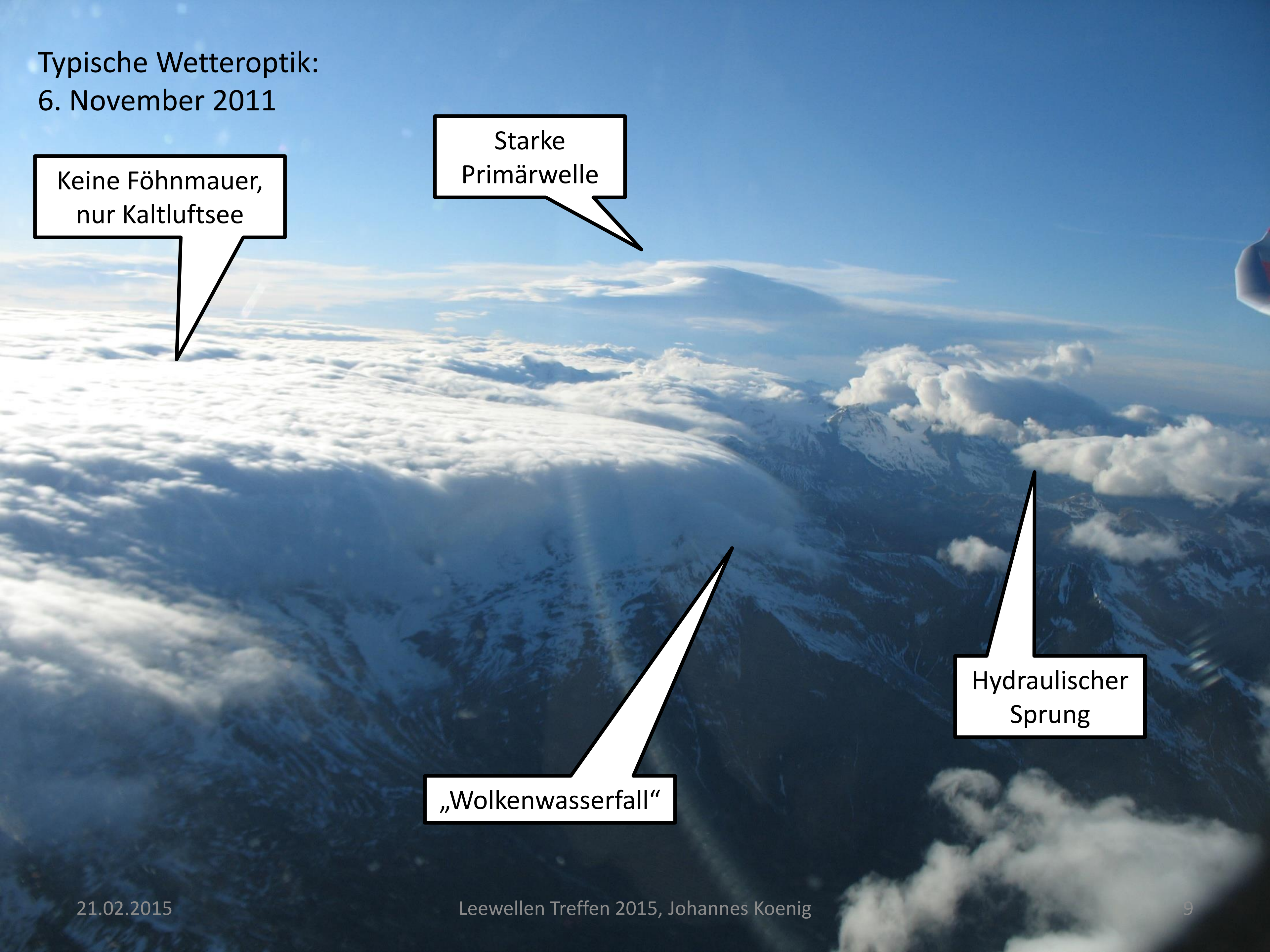
- keine Föhnmauer
- Kaltluftsee
- meist kein Niederschlag
- KEINE Hebung

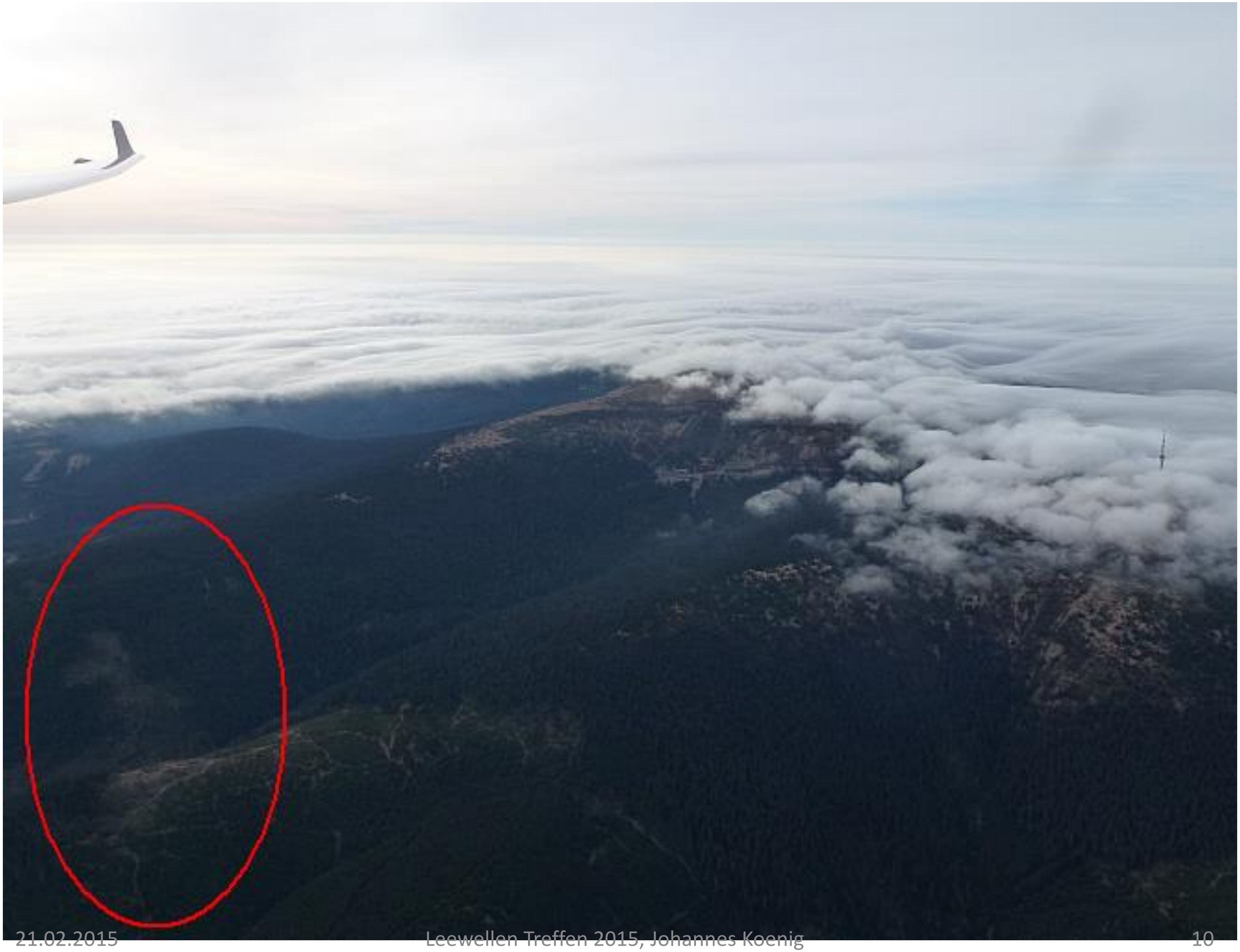
Leeseite:

- schießende Strömung nur am Hauptkamm
- nur dort hohe Windgeschwindigkeiten
- nur eine sehr starke Primärwelle
- nach der Primärwelle sehr schwacher Wind

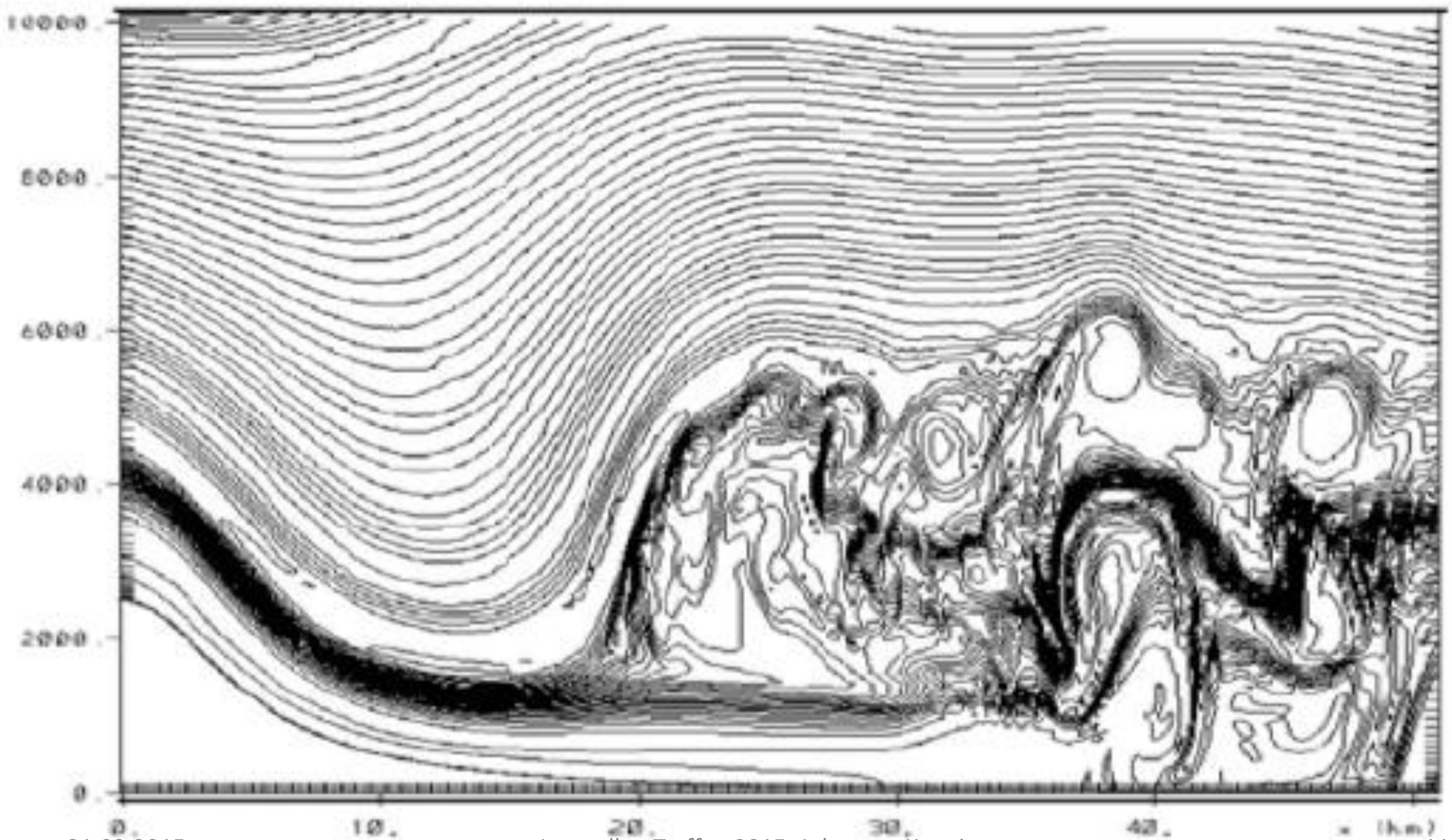


Typische Wetteroptik:
6. November 2011





Numerical Model with hydraulic jump



Beides zusammen

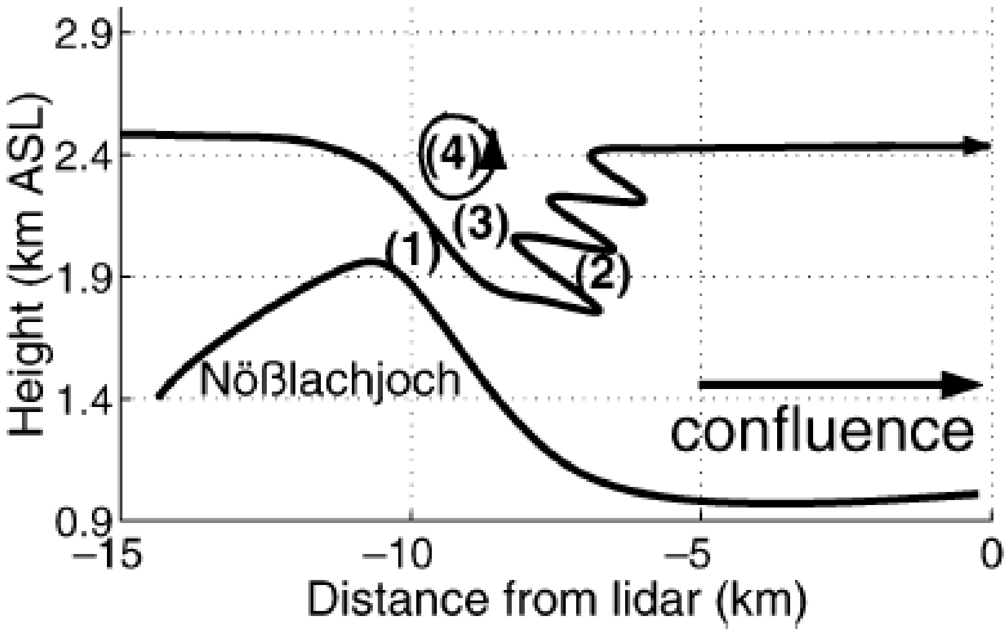


FIG. 11. Sketch of the flow over Nösslachjoch derived from Doppler lidar data (Figs. 8, 9, 10, and 12), and aircraft in situ measurements (Fig. 7). The numbers indicate the flow features discussed in the text: 1) supercritical (shooting) flow; 2) hydraulic jump; 3) region with very weak winds; 4) roller or reversed rotor. Farther downstream of Nösslachjoch (5 km south of the lidar), two branches of the flow merge to one, which leads to horizontal confluence and increased low-level wind speeds.

Turbulatoren

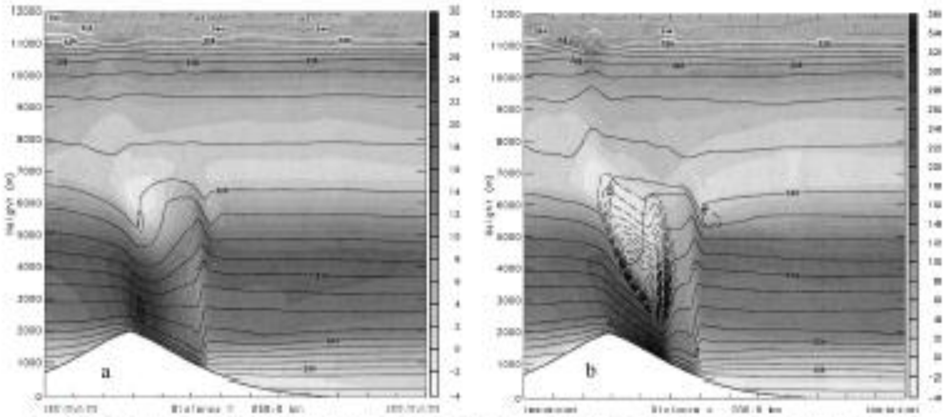


FIG. 18. Vertical cross section of potential temperature (contour interval = 2 K), wind speed (grayscale, m s^{-1}), and TKE (dashed contours, interval = 2 $m^2 s^{-2}$) for the two-dimensional smooth terrain simulation (i.e., $h_s = 0$): (a) $t = 1.5$ h; (b) $t = 3$ h.

$m^2 s^{-2}$ (Fig. 19a). The downslope wind maximum reaches 40 m s^{-1}. Correspondingly, there are two separate downslope wind speed cores located beneath the two TKE clusters. At $t = 3$ h, there are three TKE clusters, one along the wave front, and the other two located above the lee slope (Fig. 19b). The maximum wind speed reaches 44 m s^{-1} in the two valleys. Compared with the $h_s = 0$ run, the hydraulic jump is about 20 km farther downstream.

A comparison between the two simulations illustrates the importance of smaller-scale terrain in mountain wave breaking and the development of strong downslope winds. Wave breaking develops much faster in the run with multiscale terrain. The corresponding turbulence and downslope windstorm is significantly stronger. It is interesting that the second simulation captures distinct TKE peaks and downslope wind maxima as observed. Simulations using $k = 3, 4, 5, 6$ and $h_s = 100$ m, 200 m indicate that even with $h_s = 100$ m, the smaller-scale terrain tends to accelerate and enhance wave breaking, as well as the downslope windstorm. For $k \leq 4$ (i.e., a wavelength of 17.5 km), wave breaking develops faster and is more severe (i.e., larger TKE) with the increasing wavenumber. The surface drag at $t = 4$ h computed from seven simulations corresponding to $h_s = 300$ m and $k = 0$–6 is shown in Fig. 20.

The surface drag increases with increasing wavenumber until $k = 4$. The drag for $k = 4$ is more than twice

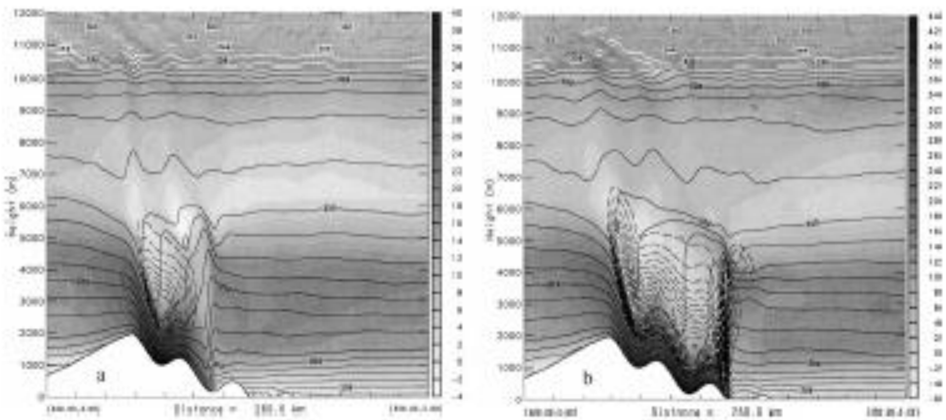


FIG. 19. Same as Fig. 18, except for $h_s = 300$ m and $k = 2$.

Rotoren durch Saugwirkung

- viel Wind
- Unterdruck
- ziemlich geordnet
- „rotieren“
- Auslöser Schwerewellen
- Auslöser orographische Kanten
- Auslöser schießende Strömung

Rotoren durch Stauwirkung

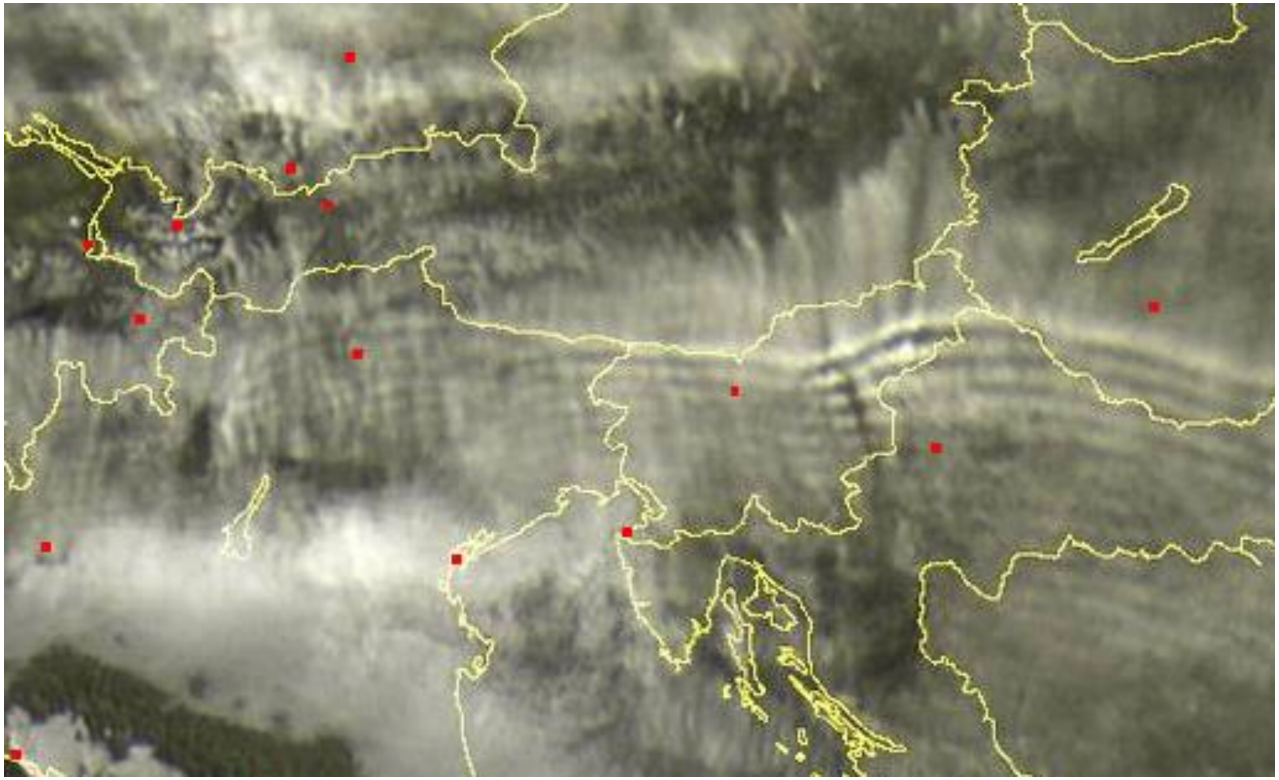
- Wind durch lokale Beschleunigung
- Durch Düsen, Fallwind oder beides
- ziemlich ungeordnet
- „strudeln“
- Auslöser überkritische Strömung
- Auslöser durch Turbulatoren

Stichworte zum googeln

- T-REX Experiment, Owens Valley
- Lee-Wave Resonances
- bora and the formation of rotors and jumps near a mountain gap
- Hydraulic aspects of föhn winds in an Alpine valley
- High-Resolution Simulations of Lee Waves and Downslope Winds over the Sierra Nevada during T-REX IOP 6
- Interacting Mountain Waves and Boundary Layers
- Observations of the Temporal Evolution and Spatial Structure of the Gap Flow in the Wipp Valley on 2 and 3 October 1999

Bilderfolgen

- lienz – rechts unten „Kehrwind“, oben Rotor
- kein-rotor
- oetztal
- saugrotor
- lienz-beides



Danke an

- Alexander Gohm
- Dieter Ettling
- Jan Lyczywek
- Hermann Trimmel
- David Richter-Trummer
- Jörg Dummann für die Einladung!