More moisture examples: lifting over two mountain ranges

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For these examples:

- DALR is 10°C/km
- MALR is 5°C/km, presumed constant
- Use the $T/VC, T_d/VS$ table included herein
- Exaggerated conditions are exploited to simplify and clarify.

The first mountain range

Consider surface air with T=30°C and VS=15 g/kg. Ultimately, we're going to lift this air over a mountain and bring it back down to the same height level on the mountain's other side. Then this air will go up and down a second mountain.

1. What is the RH of this air?
2. What is its T_d?
3. If I chill the air by diabatic/direct cooling, at what T would I expect condensation to begin forming?
4. Make an air parcel with this air, and lift it. How far above ground is cloud base (LCL)? What is the T there?
5. Lift the parcel another 1 km above cloud base. What's its new T?
6. What's its present RH?
7. Raise parcel yet another 1 km. New T?
8. How much of the parcel's original VS has condensed out by this point?
9. Say **none** of the condensation is lost to precipitation. Push the parcel 3 km back down to its original location. Compared to its starting condition, is the air now warmer, colder or the same T?
10. Say **all** of the condensation is lost to precipitation. Push the parcel 3 km back down to its original location. Compared to its starting condition, is the air now warmer, colder or the same T?
11. For this last situation, what is the new T?
12. What is the VS of this air?
13. What is the new RH for this air?
14. What is the T_d of this air?

The second mountain range

At this point, we should have T=40°C, VS=8 g/kg. Now, let's lift the air yet again, over a second mountain range.

1. Now how far is cloud base above the surface?
2. Raise this parcel another 2 km above the LCL. What is its new T?
3. Assume all condensate has been lost to precipitation. How much vapor remains in the parcel at this point?
4. Take this air and push it back down to its original height. (This should be a vertical distance of 5 km.) What is its new surface T?
5. If the VC of air this hot were (say) 80 g/kg, what's the new RH on the lee side of this second mountain?
6. And its T_d is?

Table 1: Air at sea level

T or T_d (°C)	-30	-25	-20	-15	-10	-5	0	5	10	15	20	25	30	35	40
VC or VS (g/kg)	0	0.5	1	1.5	2	3	4	6	8	12	15	22	28	40	50