

Table 1: My understanding of Downscaling

	Scale	Degree	Train(have truth)	Validation(have truth, pretend not known)	Test(no truth)
GCM	coarser	2.5*2.5	has data	has data	has data
Reanalysis	coarser	1.5*1.5	has data	has data	has data
Observation(station)	finer	0.25*0.25	has data	has data	no data

Table 2: Which one is right/wrong/not suggested?

	Train	Validation	Test
Coarser	GCM?Reanalysis?	GCM?Reanalysis?	GCM?Reanalysis?
Finer	Observation	Observation	[Goal: Observation]

- Step 1(model building): 1 coarse + (only) 1 fine = model
- Step 2(prediction): model + (future) 1 coarse (as input) = downscaling fine
- Question: what is the right(suggested) way to do downscaling?
- Question: what is the wrong way to do downscaling?
- Question: what is the not wrong way(but not very good way) to do downscaling?
 - How to choose the coarse scale variable, GCM or Reanalysis? In Step 1 and Step 2.
 - Train + Validation: what is the coarse scale variable, GCM or Reanalysis?
 - Train + Test: what is the coarse scale variable, GCM or Reanalysis?

Here are the T.J.'s comments

1 For testing downscaling models I'd recommend using a reanalysis dataset rather than a GCM to allow for better evaluation. When you evaluate using a GCM assumptions are made that the GCM is analogous to the "true" climate, along with others.

2 cannot evaluate downscaled GCM projections with observed data

So,

1 Train(Reanalysis)+Validation(Reanalysis)+Test(GCM) is right(suggested)?

2 What about: Train(Reanalysis)+Validation(Reanalysis)+Test(Reanalysis)?

3 Train(GCM)+Validation(GCM) is wrong?

4 Train(GCM)+Validation(Reanalysis) is right but not suggested?