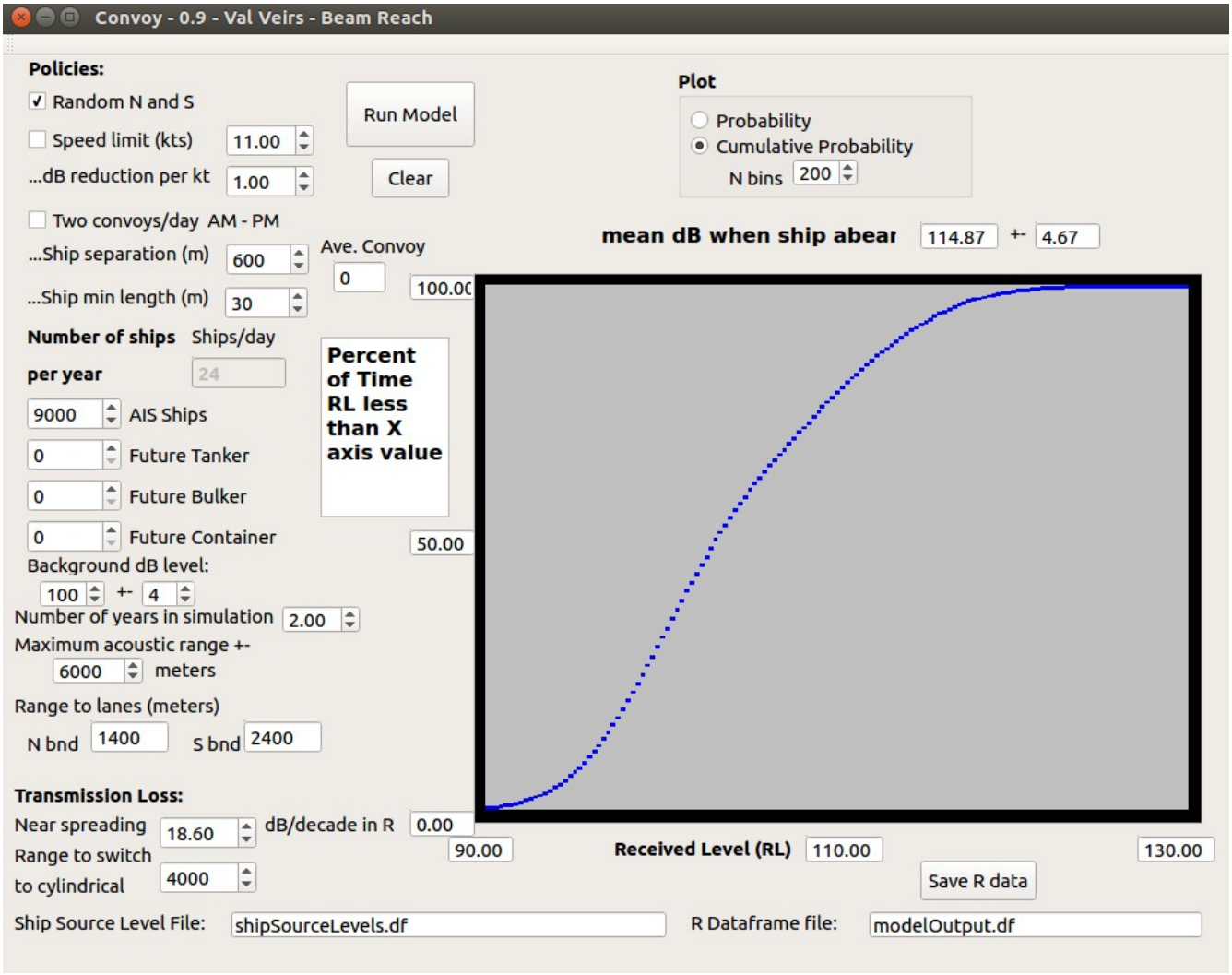
Convoy model of ship noise – ver. 0.9 – Val Veirs – Beam Reach – Oct. 1, 2017

Run #1:



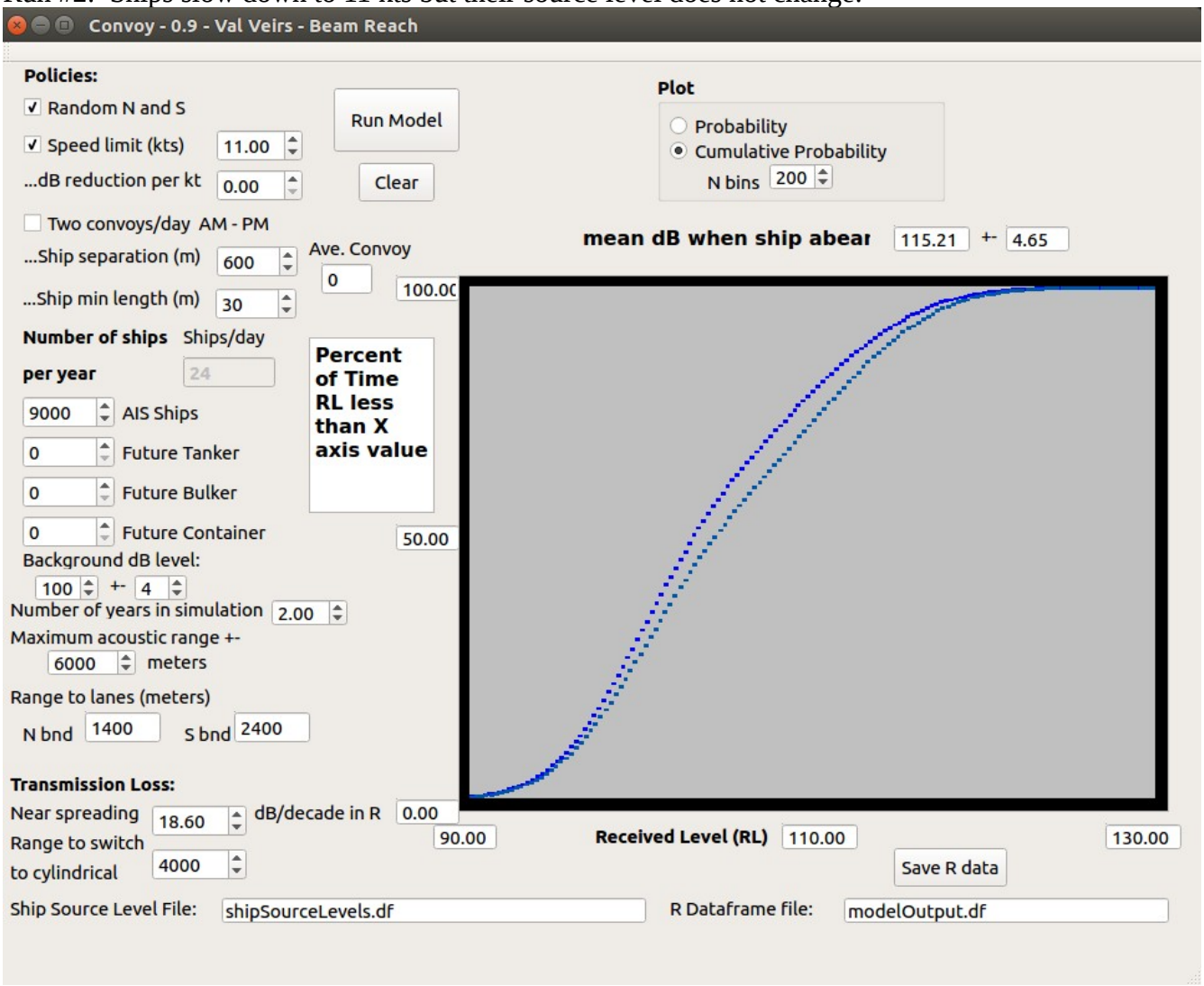
This model calculates the percentage of the time that the underwater noise received level is less than any specified value. In the graph above, 50% of the time, the noise is less than about 105 dB, for example.

The model uses ship source levels reported by Veirs et. al. PeerJ (2/20/2016) which are listed in the data file called shipSourceLevels.df in the image above. The results of the model can be saved to disk with the Save R Data button.

Three different policies can be compared. (1) Ships pass randomly north and south, (2) Ships that usually go faster than a specified speed limit (11 kts above) slow down to 11 kts, and (3) Ships longer than a specified length transit north in one convoy per day and south in a second convoy per day.

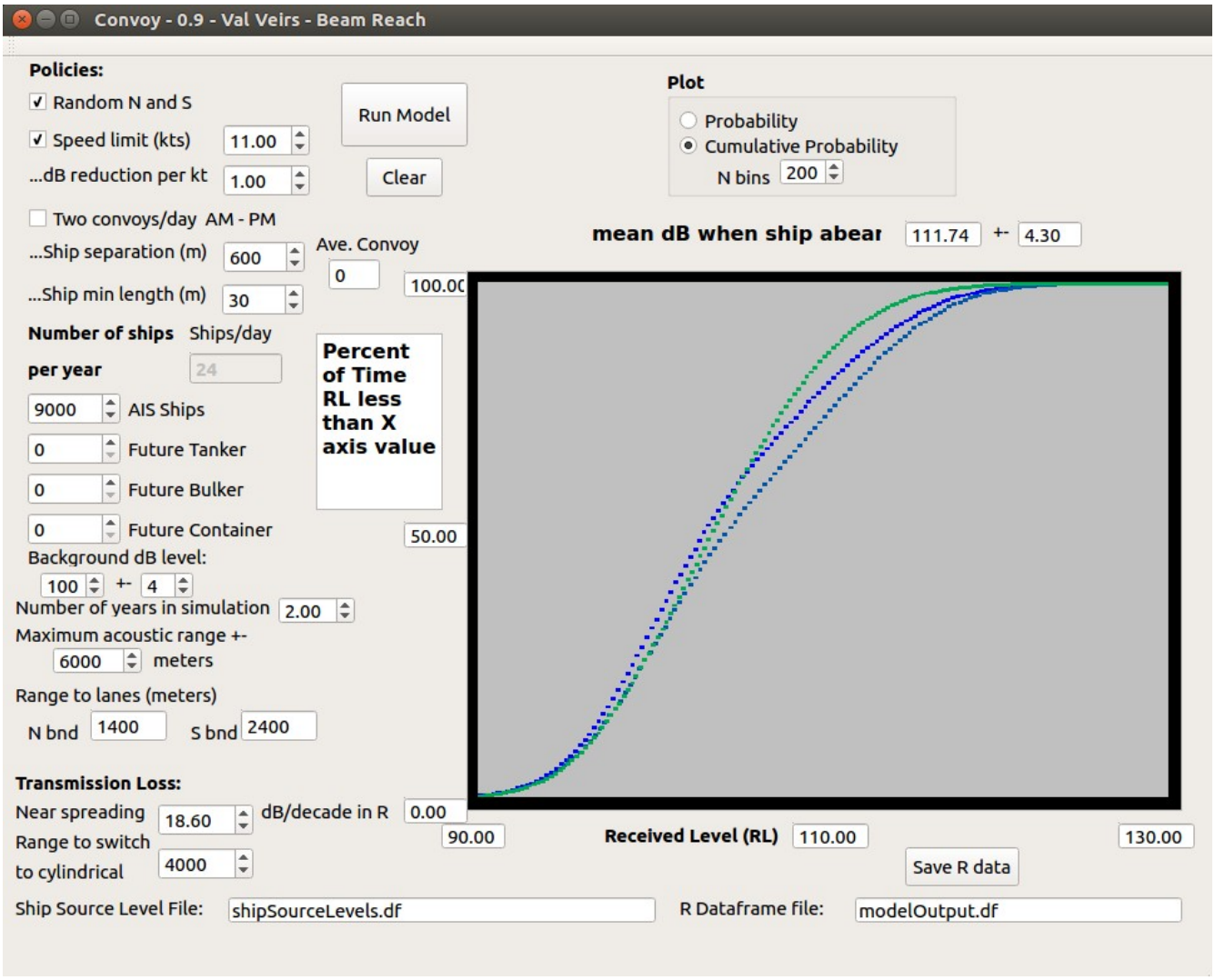
Some sample runs:

Run #2: Ships slow down to 11 kts but their source level does not change:



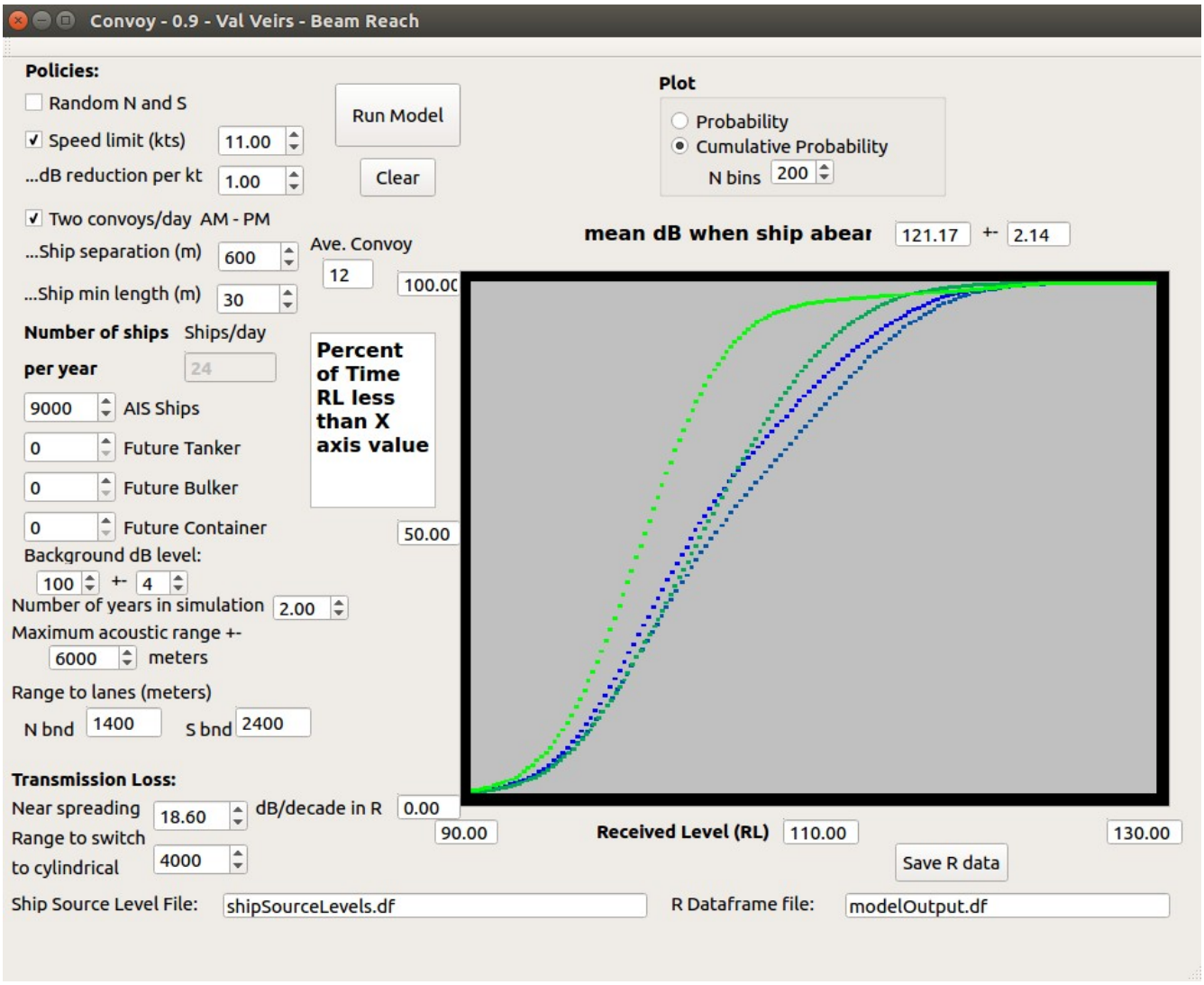
Slowing the ships down lowers the curve. This happens because the ships take longer to pass by. For example, at a RL of 110 dB, for example, the percent of time that the noise is less than 110 dB drops from about 75% or the time to about 70% of the time.

Run #3:



Here, the ships' source levels drop 1 dB for each knot that they decrease their speed to slow down to the speed limit and the result is the green curve. At high RL's the percentage of time that the R is less than any high value is increased. This is good for the whales. However, at low RL's the green curve is a bit below the base case (Run #1) showing that the slowdown is bad for the orca at quiet times.

Run #4:



In Run #4, the larger ships are grouped into two convoys per day, one in-bound and one out-bound. The average number of ships in each convoy is 12 ships. The bright green curve is well above the other model runs showing that from a Percent of time that the RL is less than any specified value, the convoy approach is much better for the orca than the other policies.