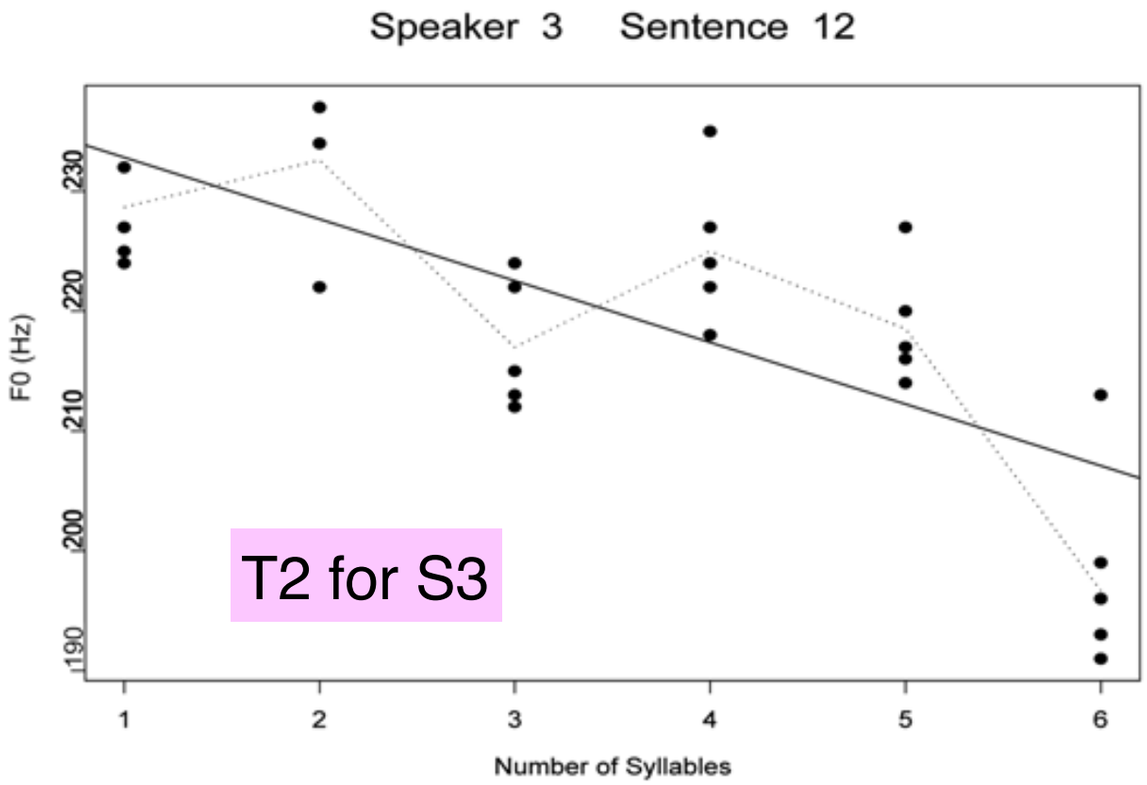
Mambila Declination Model

Goal: Model Declination data in Connell



- Significant declination: T4>T3>T2>T1
- Speakers differ in whether they have significant declination in high tones (T1, T2)

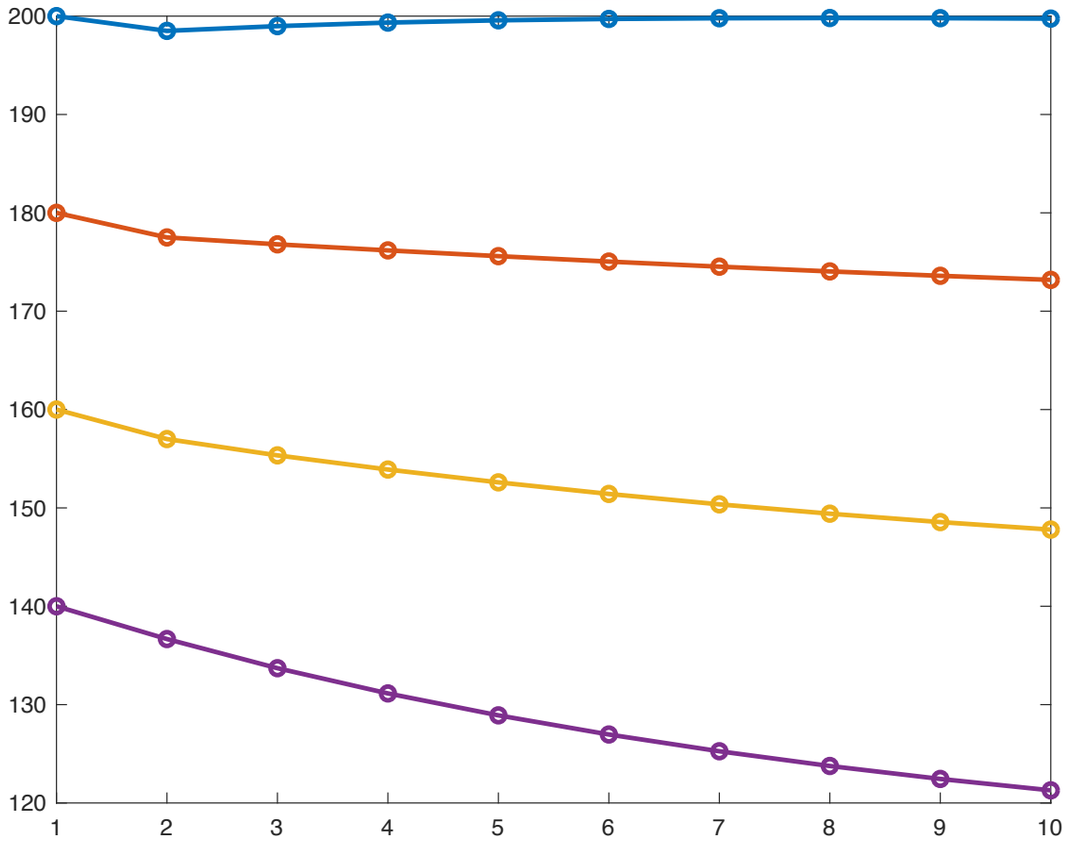
Table 1: Summary of results for like tone sentences across five speakers

	Tone 1		Tone 2		Tone 3		Tone 4		
Speaker	**S**	**L**	**S**	**L**	**S**	**L**	**S**	**M**	**L**
1 (M)	–, –	–, –	–, –	–, –	–, –	D, (F)	–, F	D, F	D, –
2 (M)	D, –	–, –	D, –	D, –	–, –	D, (F)	–, F	D, –	D, F
3 (F)	–, –	–, –	–, (F)	–, (F)	D, –	–, (F)	–, F	D, F	D, –
4 (F)	–, –	D, –	D, –	D, –	–, (F)	D, –	–, F	D, F	D, (F)
5 (M)	–, –	D, –	D, –	D, (F)	–, (F)	D, (F)	–, F	D, F	D, (F)

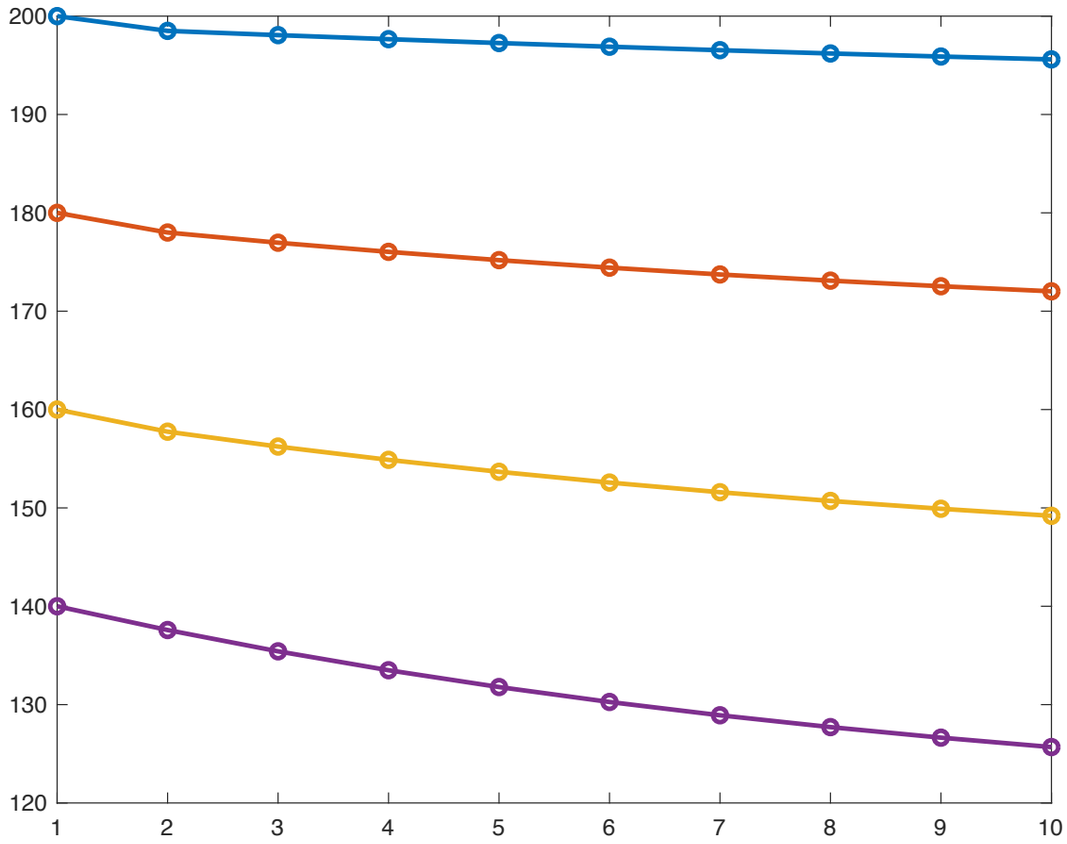
Model

- Model declination in target values of all four tones every syllable (whether they are selected in any syllable or not).
  - Control with a 1st order linear declination system with a goal for each tone slightly lower (~15 Hz) than its initial value.
- Model tonal repulsion:
  - The tone targets also repel each other with a force that is inversely proportional to the current f0 difference between the two tones.
- Individual speakers differ in the overall scaling of the repulse force (r)
  - Set r = 20 for S1-S3, r = 10 for S4-S5

r = 20



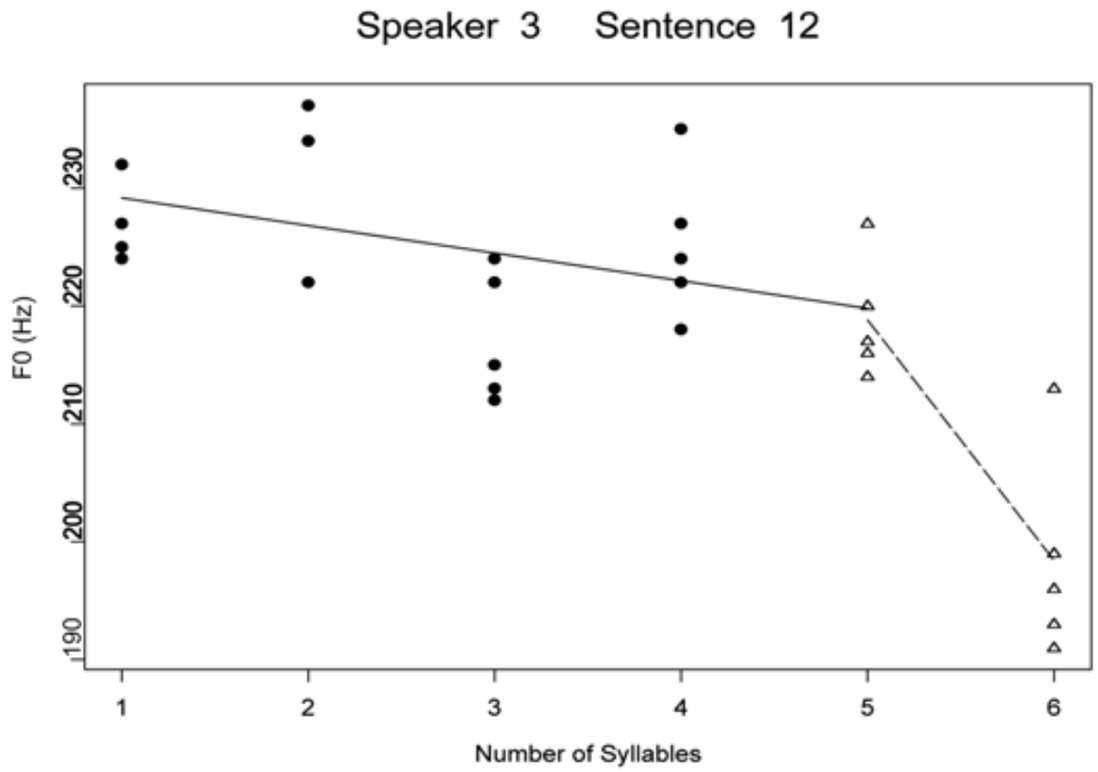
r = 10



- Repulsion forces will always force T1 up and T4 down
- But upward force on T1 is balanced by declination force

Outstanding Problems

- Some kind of nonlinear system needed to select starting values of tones.
- Constraints on choice of r, k: we never see speakers showing negative declination of T1.
- Final lowering: Assume a L% tone
  - Target lower than the low goal of T4.
  - It attracts all tones towards it with a strength inversely proportional to distance from it.



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2 (M)	D, –	–, –	D, –	D, –	–, –	D, (F)	–, F	D, –	D, F
3 (F)	–, –	–, –	–, (F)	–, (F)	D, –	–, (F)	–, F	D, F	D, –
4 (F)	–, –	D, –	D, –	D, –	–, (F)	D, –	–, F	D, F	D, (F)
5 (M)	–, –	D, –	D, –	D, (F)	–, (F)	D, (F)	–, F	D, F	D, (F)