Adjusting IGL (T_2) to be More Accurate

Based on the fact different cold TP and TT results in linear and parallel TP and TT increases, we can modify formulas to match data.

Can modify T_2 in the IGL equation to force correct (actual) tire pressures.

Replace T_2 with regression equation representing actual data.

Adj T_2	Actual T_2	P_2	T_1 Tire Temp	LF Regression Cold	LF IGL Cold	LF IGL Adjusted
124	96.8	28.4	66	24.066	26.02537055	24.13664329
123	96.8	28.4	67	24.2145	26.10247057	24.27659265
122	96.8	28.4	68	24.363	26.1795706	24.41702321
121	96.8	28.4	69	24.5115	26.25667063	24.55793746
120	96.8	28.4	70	24.66	26.33377065	24.69933789
119	96.8	28.4	71	24.8085	26.41087068	24.84122703
118	96.8	28.4	72	24.957	26.4879707	24.98360742
117	96.8	28.4	73	25.1055	26.56507073	25.12648161
116	96.8	28.4	74	25.254	26.64217075	25.26985217
115	96.8	28.4	75	25.4025	26.71927078	25.4137217
114	96.8	28.4	76	25.551	26.79637081	25.55809281
113	96.8	28.4	77	25.6995	26.87347083	25.70296812
112	96.8	28.4	78	25.848	26.95057086	25.84835028
111	96.8	28.4	79	25.9965	27.02767088	25.99424196
110	96.8	28.4	80	26.145	27.10477091	26.14064583
109	96.8	28.4	81	26.2935	27.18187094	26.2875646
108	96.8	28.4	82	26.442	27.25897096	26.43500099
107	96.8	28.4	83	26.5905	27.33607099	26.58295774

Adjusted Front IGL

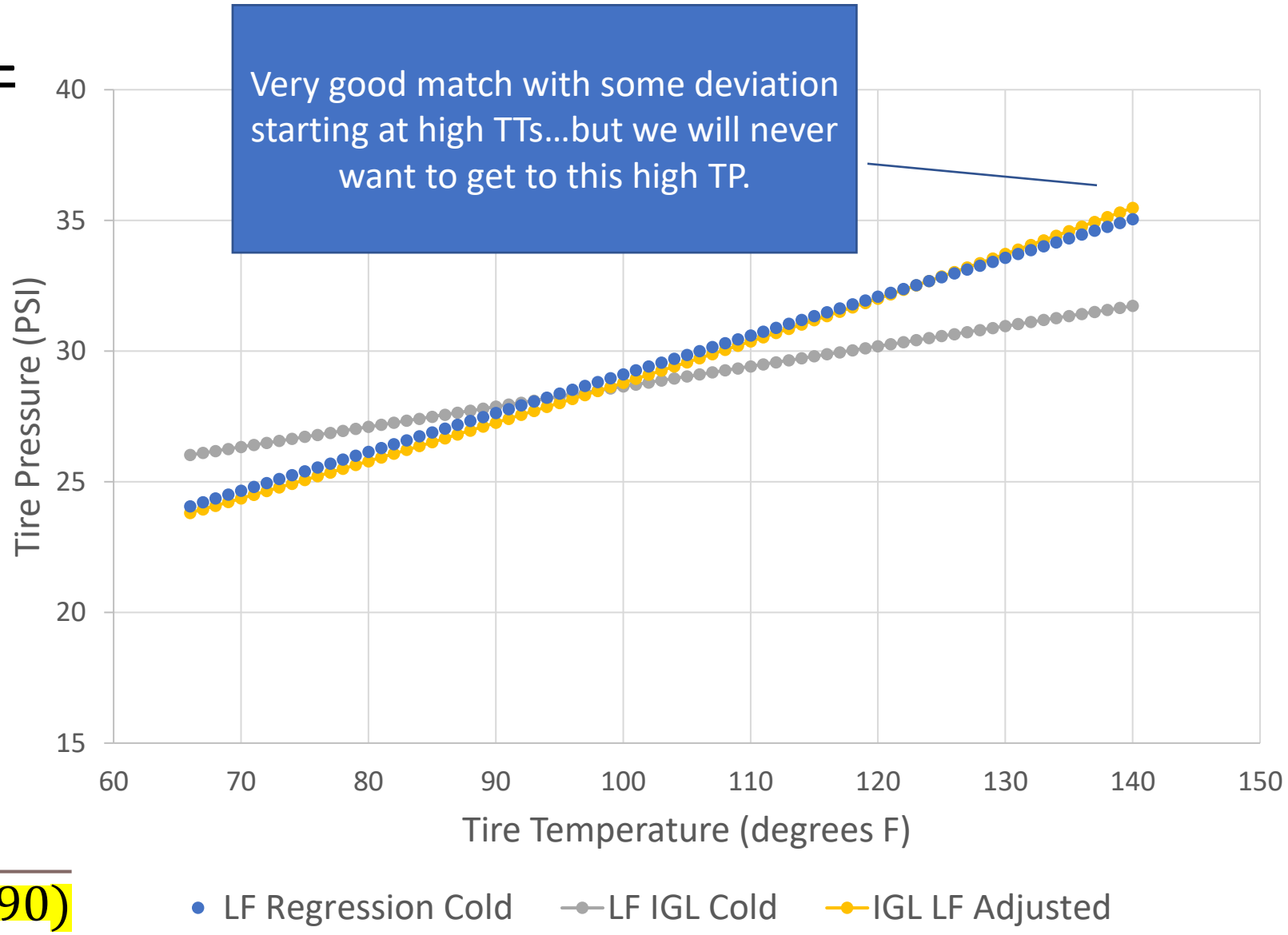
Can modify T2 in the IGL equation to force correct (actual) tire pressures.

Replace T2 with regression equation representing actual data.

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \Rightarrow P_1 = P_2 \cdot \frac{T_1}{T_2}$$

…becomes…

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \Rightarrow P_1 = P_2 \cdot \frac{T_1}{(-T_1+190)}$$



Excel Formula=((((**P_2***0.0689475729)+1)*((((**T_1**-32)*5/9)+273.15)/((((**$-T_1+190$**-32)*5/9)+273.15)))-1)*14.5038

Which Method is Best?

	Prediction Approach		
	Percent Gain	**Regression Equation**	**IGL**
Provide cold TP estimate?	Sort of	Sort of	Yes
Determine a target PSI?	Sort of	Sort of	Yes
Represents actual data?	Yes	Partially	Partially
Accurate profile?	Partially	Yes (sort of)	Yes (sort of)
Easy to use?	Yes	Yes	Yes

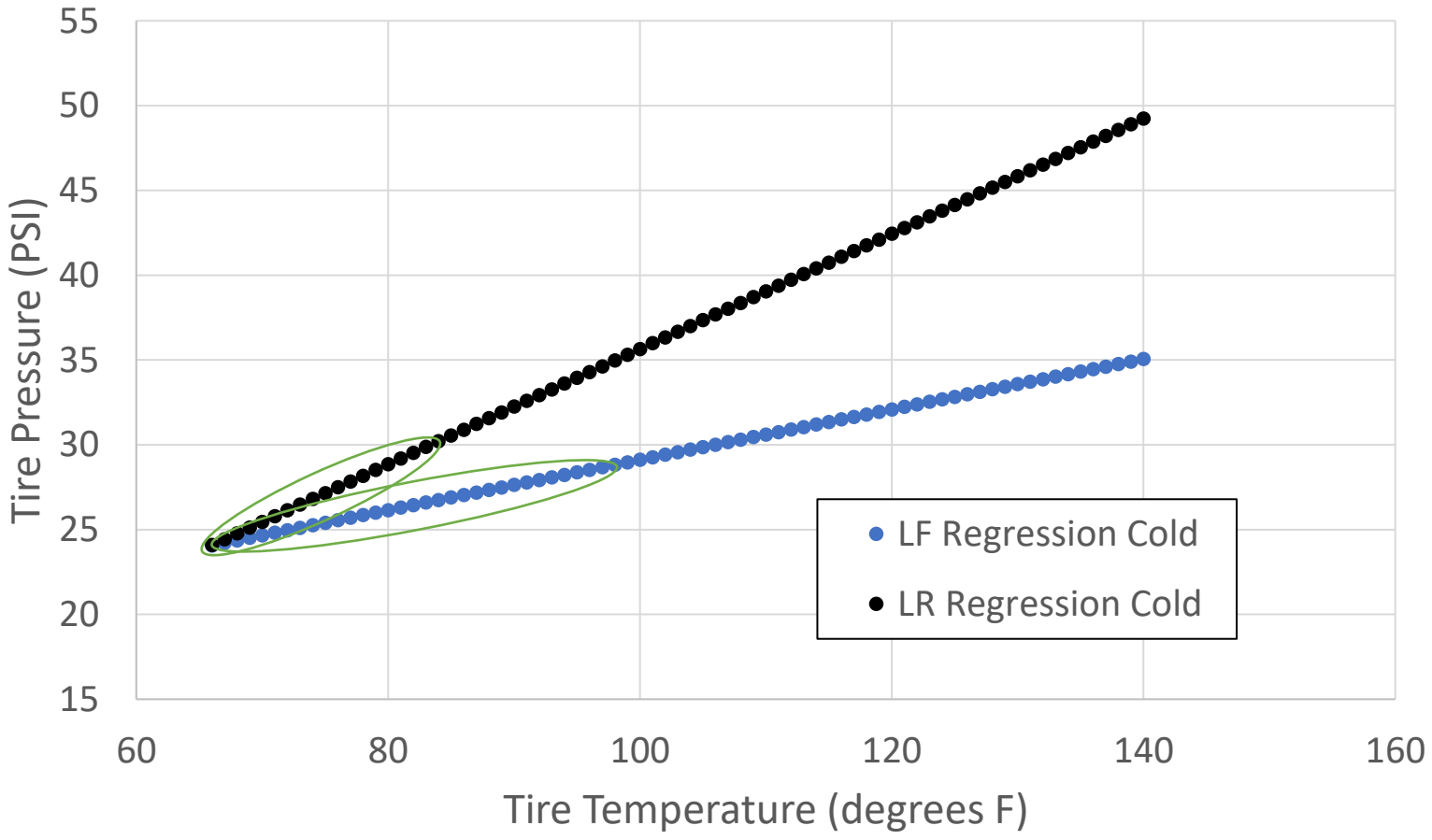
No solution is perfect but which is best? IGL

Now for the Interesting Stuff

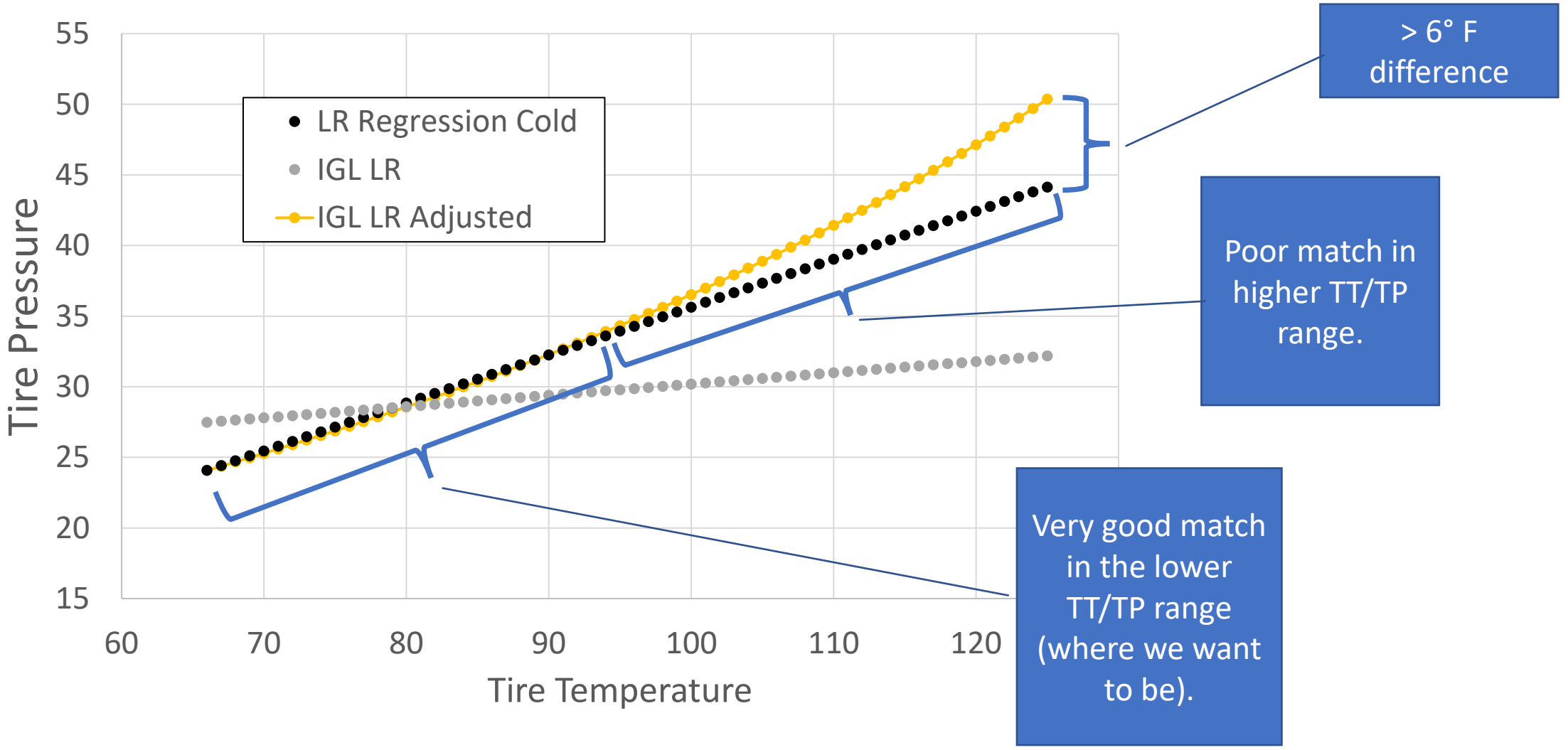
Front TP will increase at a lower rate per degree TT increase compared to the rear tires TP.

Example: if you set all tires at 23.63 psi at the start of a session, the front tires will end at a higher temperature and lower pressure, compared to the rear tires.

July 2022 Event		
Sat Practice AM		
	Front	Rear
Start TP (PSI)	23.63	23.63
Cold TT (F)	66.2	66.2
Max G TP (PSI)	28.4	29
Max G TT (F)	96.8	85



Adjusted Rear IGL



Validation

	Regression Eq.	IGL Original	IGL Adjusted
Cold TP Prediction (P1)	24.1	23.6	24.2
Cold TT (T1)	66.2	66.2	66.2
Hot TP (P2)	NN	28.4	28.4
Hot TT (T2)	NN	132.0	NN
Actual Cold TP	23.63	23.63	23.63
Actual Hot TT	96.80	96.80	96.80

Good

	Regression Eq.	IGL Original	IGL Adjusted
Cold TP Prediction (P1)	26.8	24.2	26.0
Cold TT (T1)	84.2	84.2	84.2
Hot TP (P2)	NN	27.6	27.6
Hot TT (T2)	NN	132.0	NN
Actual Cold TP	22.9	22.9	22.9
Actual Hot TT	84.20	84.20	84.20

Arghh

W T Heck !!!

	Regression Eq.	IGL Original	IGL Adjusted
Cold TP Prediction (P1)	24.9	26.1	24.9
Cold TT (T1)	71.6	71.6	71.6
Hot TP (P2)	NN	28.4	28.4
Hot TT (T2)	NN	102.2	NN
Actual Cold TP	22.9	22.9	22.9
Actual Hot TT	71.60	71.60	71.60

Goodish

Higher TTs, lower IGL Accuracy

	Regression Eq.	IGL Original	IGL Adjusted
Cold TP Prediction (P1)	26.5	25.7	25.7
Cold TT (T1)	82.4	82.4	82.4
Hot TP (P2)	NN	27.6	27.6
Hot TT (T2)	NN	107.6	NN
Actual Cold TP	23.6	23.6	23.6
Actual Hot TT	107.60	107.60	107.60

Arghh

Considerations to Consider Considering

- IGL may be based on nitrogen (don't know), may be reason for the difference between IGL and actual data.
- Need to verify that the range of TP gain is different based on starting TT/TP. IGL is supposed to address this.
- Front and rear tires may need different cold TPs to allow front and back to reach optimal, but different, hot TPs.
- Beware…different TP readings on different gauges. For example, TP sensor reads 1.5 lbs **lower** than handheld gauge.
- Need more data.
- Front versus rear TP x TT inverse relationship is a mystery.
- Mike needs professional help!

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Recommendations

- Aim for 28.4/30 PSI.
- Use one of the formulas to determine cold TP in the morning…likely to be around 23.5 (25 PSI on handheld gauge).
- Use the Dr. J approach throughout the day as formulas for hot TP seem unreliable (he does know best).
- Keep tires/rims out of the sun. If not possible, be aware that performance may not be consistent until hot TP is reached.
- Hot TP is reached after 4 or 5 laps cold, fewer when warm/hot.