

Overview of CATC Development

MIIT, China

2017.06



Background

- With the rapid increasing of automotive industry and vehicle parc, the transportation status changed significantly in China.
- NEDC, the currently-used type approval cycle, is inconsistency with the characteristics of the actual driving condition in China, and the fuel consumption gaps between lab/real are becoming larger.
- Current regulations can't accurately evaluate the new techs, i.e. the technologies for new energy vehicles.

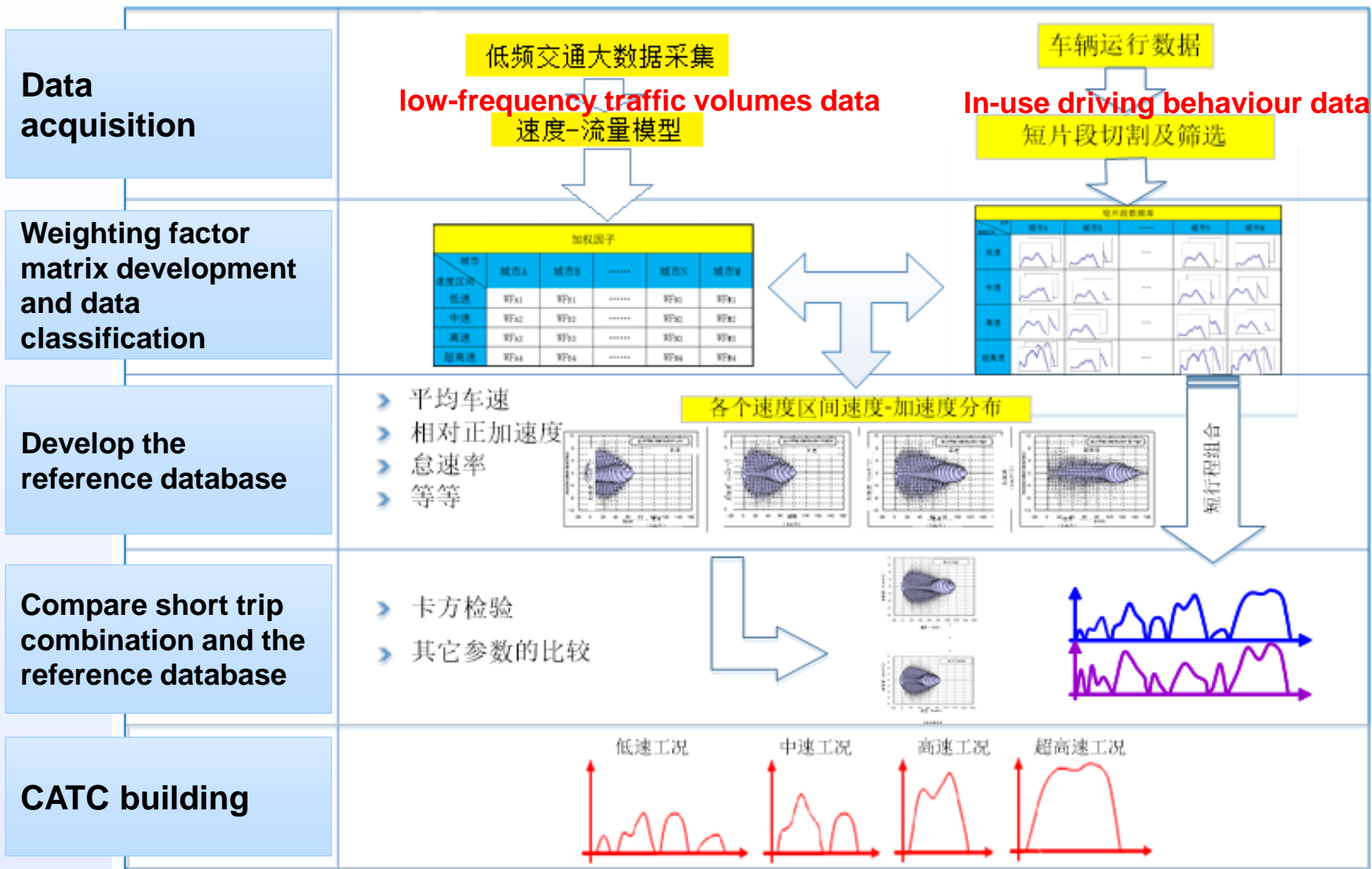


Targets

- China Automotive Testing Cycle (CATC) program was launched by MIIT and other related ministries of China. CATARC led the this 3-year program with hundreds of researchers from 50+ Univ./Ins./OEM.
- Main Targets:
 - ✓ Develop the testing cycle for fuel consumption/emission
 - National/regional CLTC (light-duty) and CHTC (heavy-duty), including new energy vehicles
 - ✓ Research and evaluate the test procedure



Development Roadmap





Vehicle Selection

Vehicle Type	Energy type	Vehicle Usage	Transmission Type	Source
Light-duty vehicle	PHEV	Taxi	AT	Taxi enterprise
			CVT	
		Private	AT	Collected online; Staffs' in project unit
			MT	
	EV	Taxi	AT	Taxi enterprise
			CVT	
		Private	AT	Collected online; Staffs' in project unit
			CVT	
	HEV	Private	AT	Collected online; Staffs' in project unit
			CVT	
			MT	
		Official	AT	Official vehicles in project unit
			CVT	
			MT	
	Conventional vehicles	Taxi	MT	Taxi enterprise
Private		AT	Collected online; Staffs' in project unit	
		CVT		
		MT		
Official		AT	Official vehicles in project unit	
		CVT		
	MT			



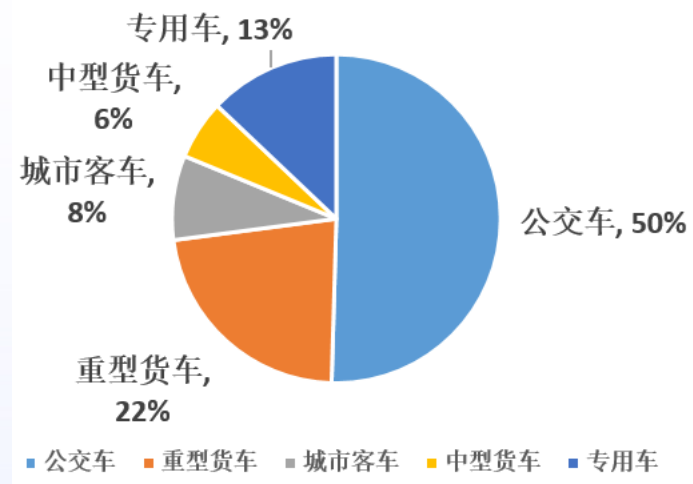
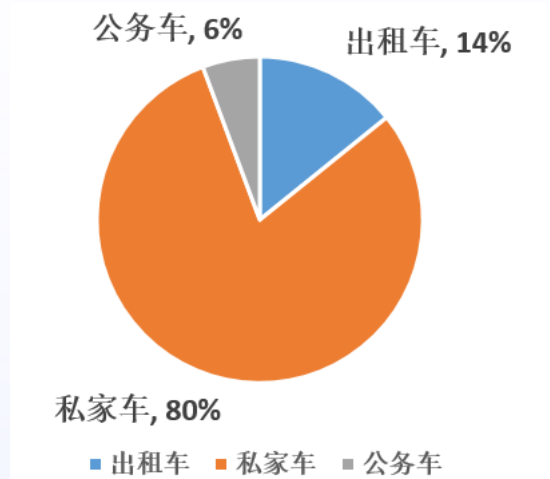
Vehicle Selection (cont'd)

Vehicle Type	Energy type	Vehicle Usage	Transmission Type	Source
Heavy-duty vehicle	PHEV	Bus	AT	Cooperation with bus group
			CVT	
	EV	Bus	CVT	Cooperation with bus group
			AT	
		Mail	CVT	Cooperation with post office
			AT	
		Sanitation	CVT	Cooperation with environmental department
			AT	
	HEV	Bus	AT	Cooperation with bus group
			CVT	
			MT	
	Conventional vehicles	Mail	AT	Cooperation with post office
			MT	
		Sanitation	AT	Cooperation with environmental department
			MT	
		Bus	AT	Cooperation with bus group
MT				
Logistics		MT	Cooperation with logistics enterprise	
		Intercity bus	AT	Cooperation with passenger transport enterprise
MT				

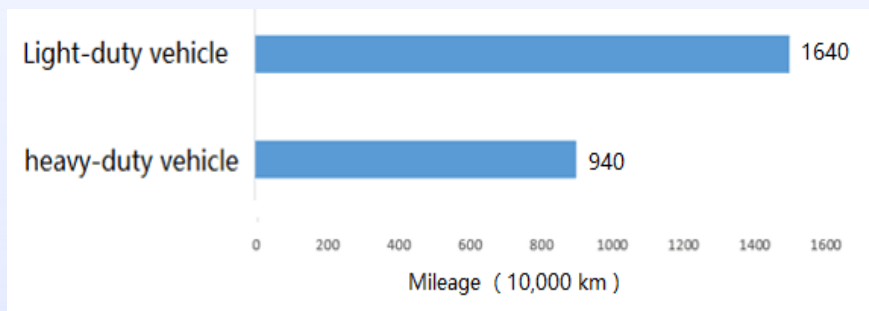


Data Collection

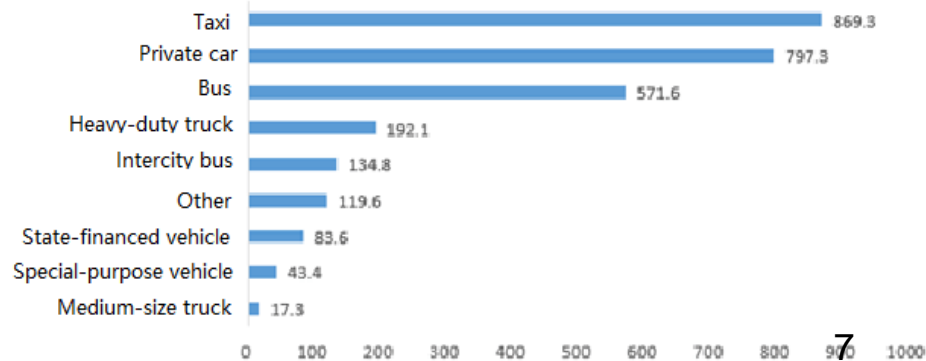
3900 vehicles, 27 million km



3082(LD total) and 1059 (NEV, 34%)



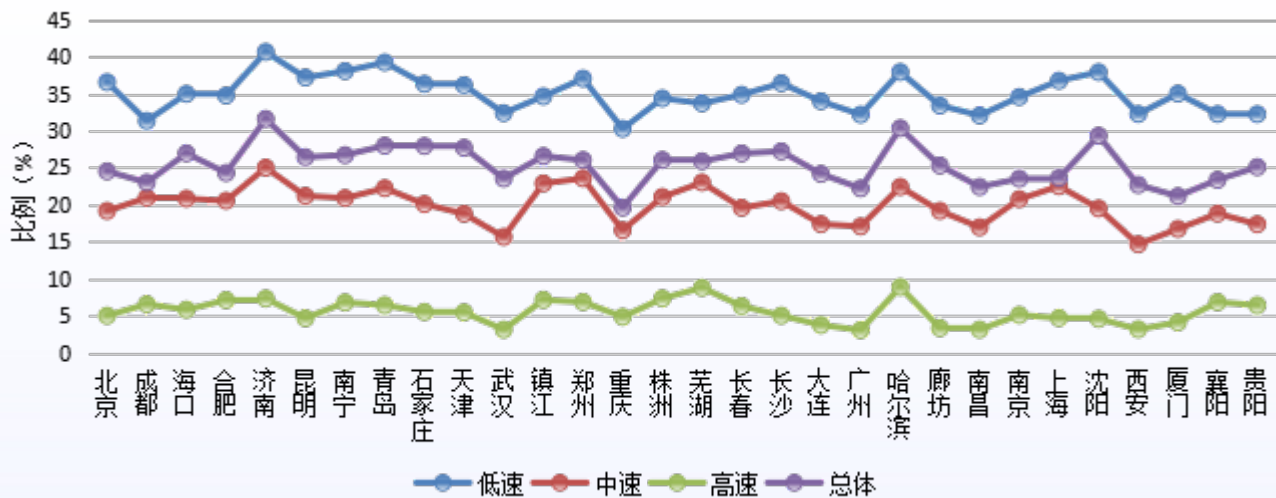
908(HD total) and 110 (NEV, 12%)



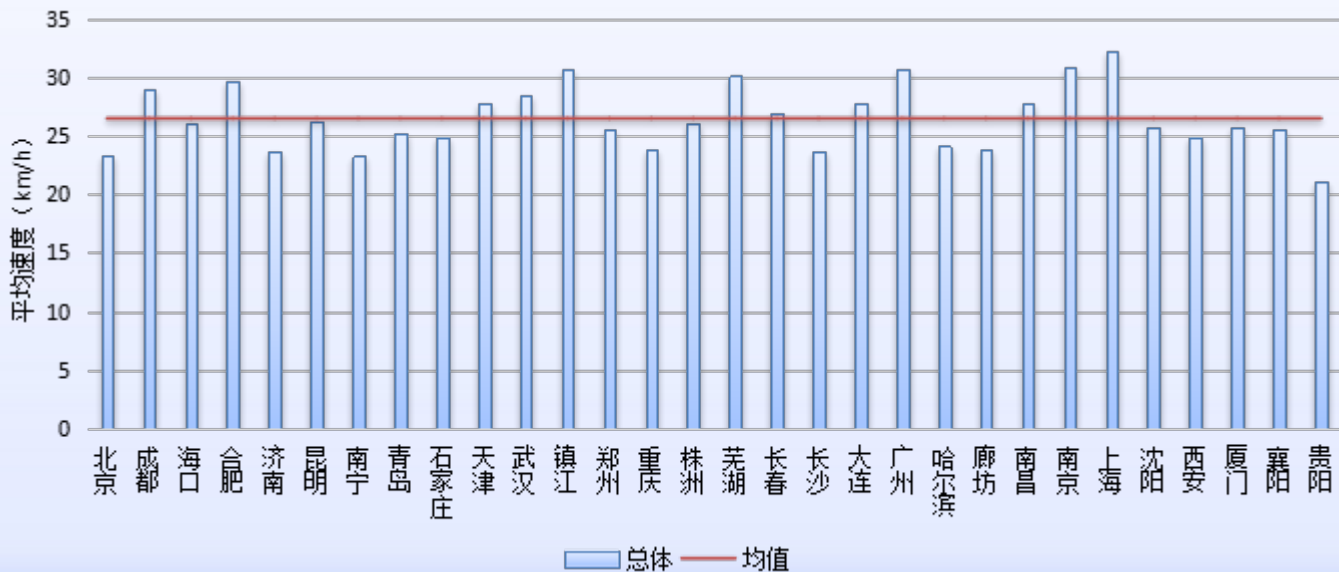


Feature Analysis

Idle Ratio

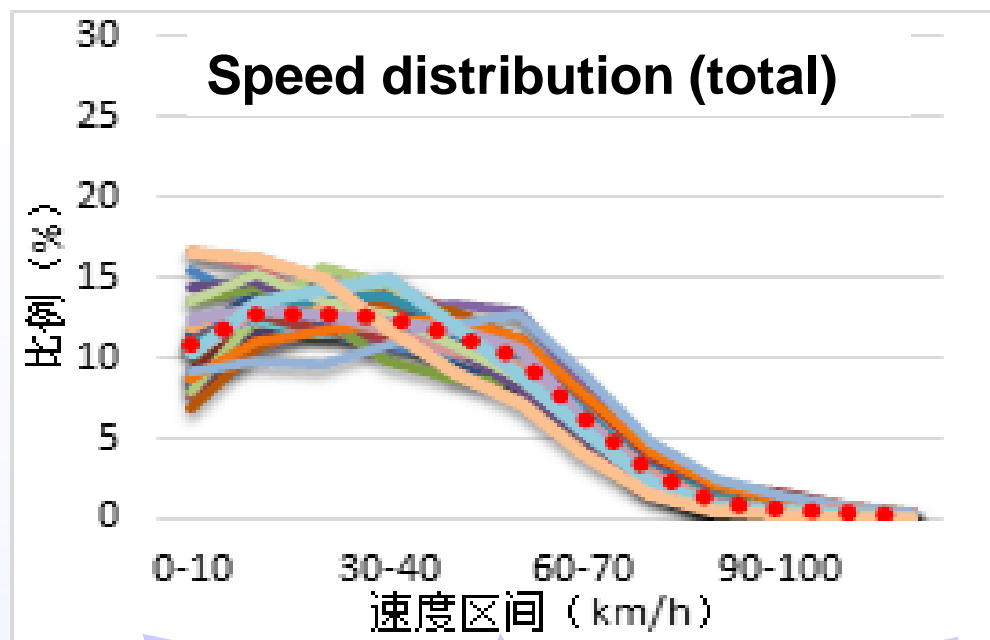


Average Speed



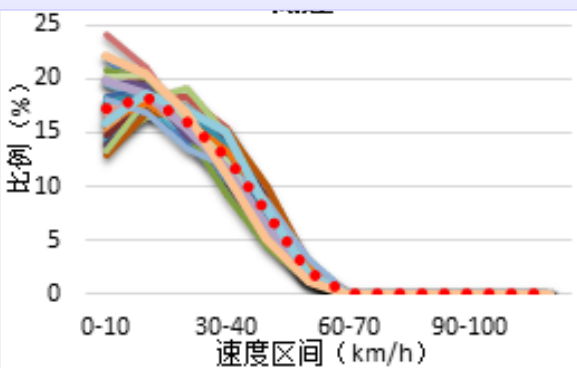


Feature Analysis (Cont'd)

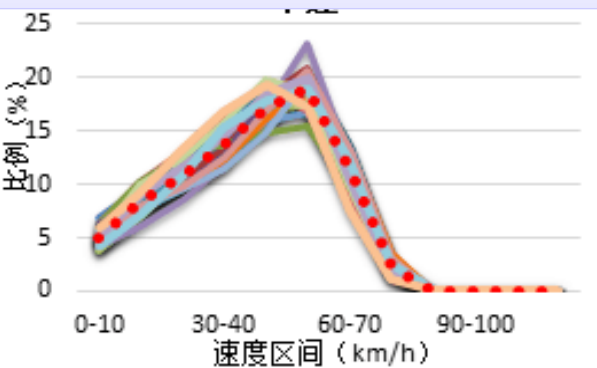


LS: ≤ 60
MS: 60-80
HS: ≥ 80

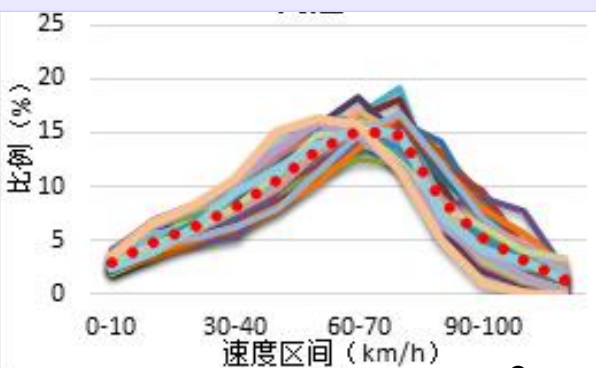
Speed distribution (LS)



Speed distribution (MS)



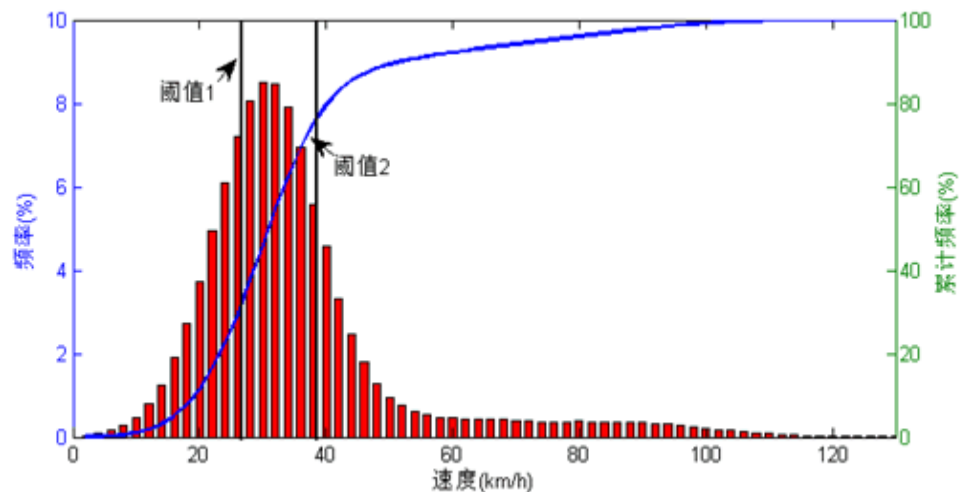
Speed distribution (HS)





Weight Factor

- **Big traffic data collection (every 5 mins in 41 cities) from GIS**
- **Split into 3 speed phases: low/mid/high**



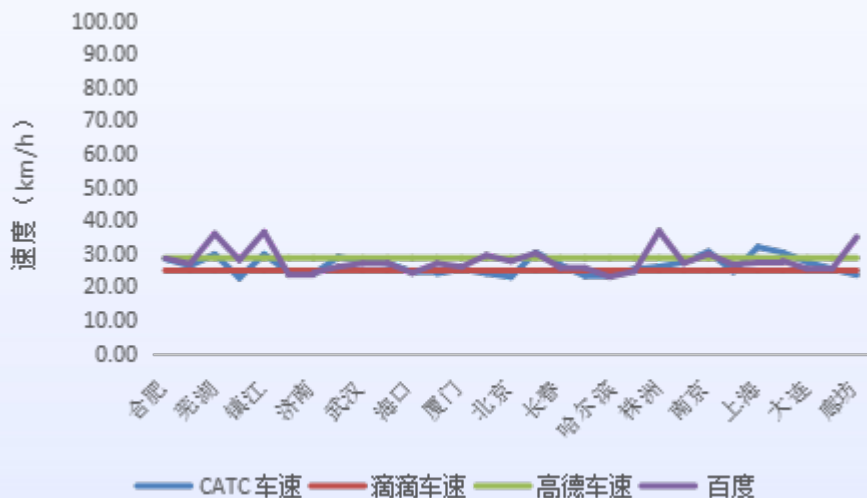
City	交通量 (车流)				交通量比率			
	LS	MS	HS	Total	LS	MS	HS	Total
北京	2.78E+09	2.93E+09	1.57E+09	7.29E+09	38.17%	40.23%	21.60%	100.00%
天津	1.70E+09	1.37E+09	1.27E+09	4.34E+09	39.17%	31.54%	29.29%	100.00%
石家庄	5.58E+08	7.38E+08	8.04E+08	2.10E+09	26.57%	35.15%	38.28%	100.00%
长春	1.08E+09	1.25E+09	8.17E+08	3.15E+09	34.22%	39.81%	25.96%	100.00%
南京	1.42E+09	2.46E+09	2.02E+09	5.91E+09	24.07%	41.71%	34.22%	100.00%
.....
全国	4.16E+10	4.28E+10	2.67E+10	1.11E+11	37.44%	38.50%	24.06%	100.00%



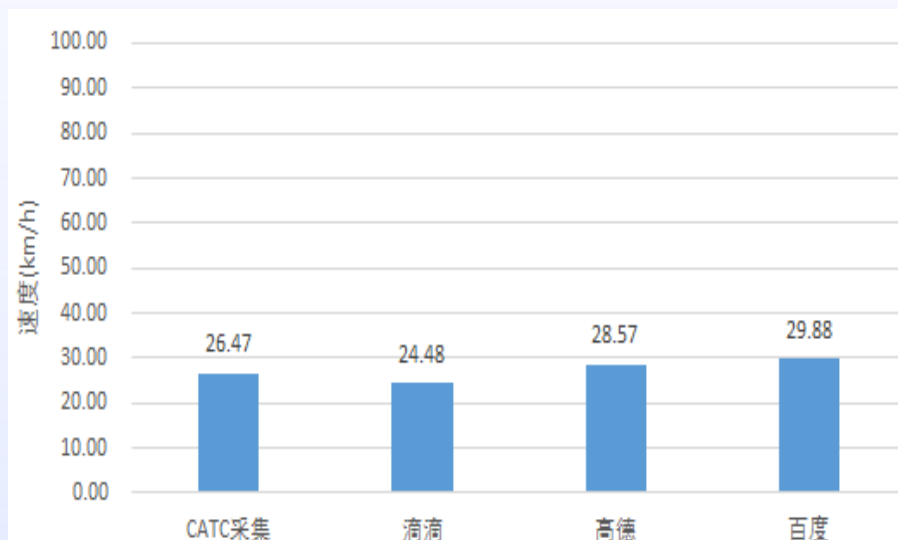
Data Validation

- Compare CATC data characteristic with other big traffic data, i.e. Didi, AMAP and Baidu.
- The speed of CATC is in line with China's reality.

Average speed in different cities

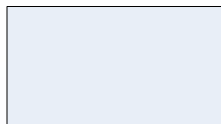


Average speed of different data base



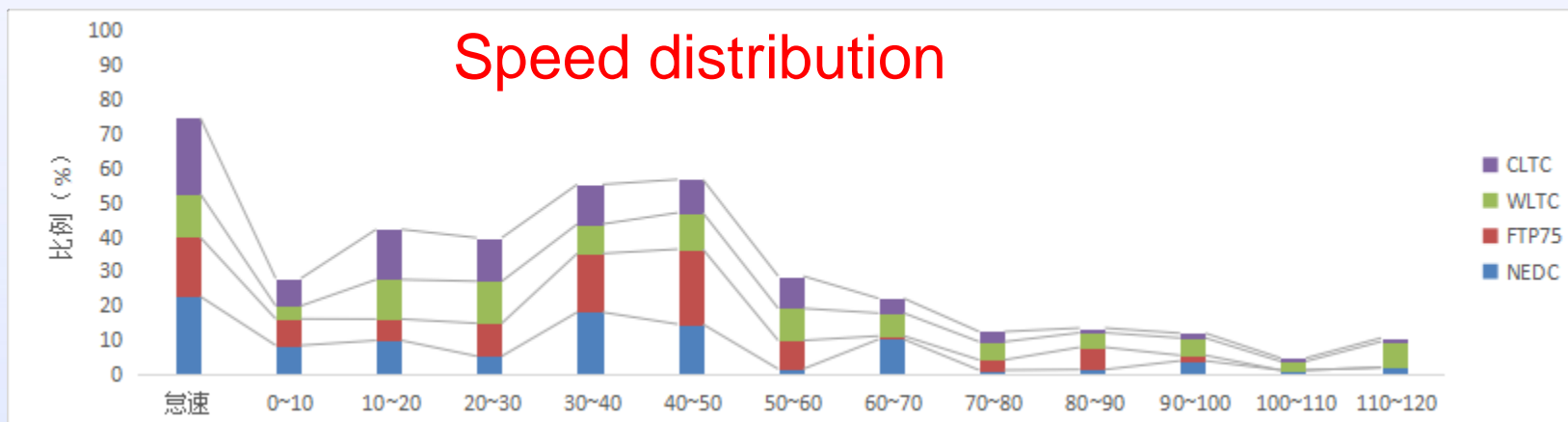


CATC Curve



Cycle Comparison of CLTC(P)

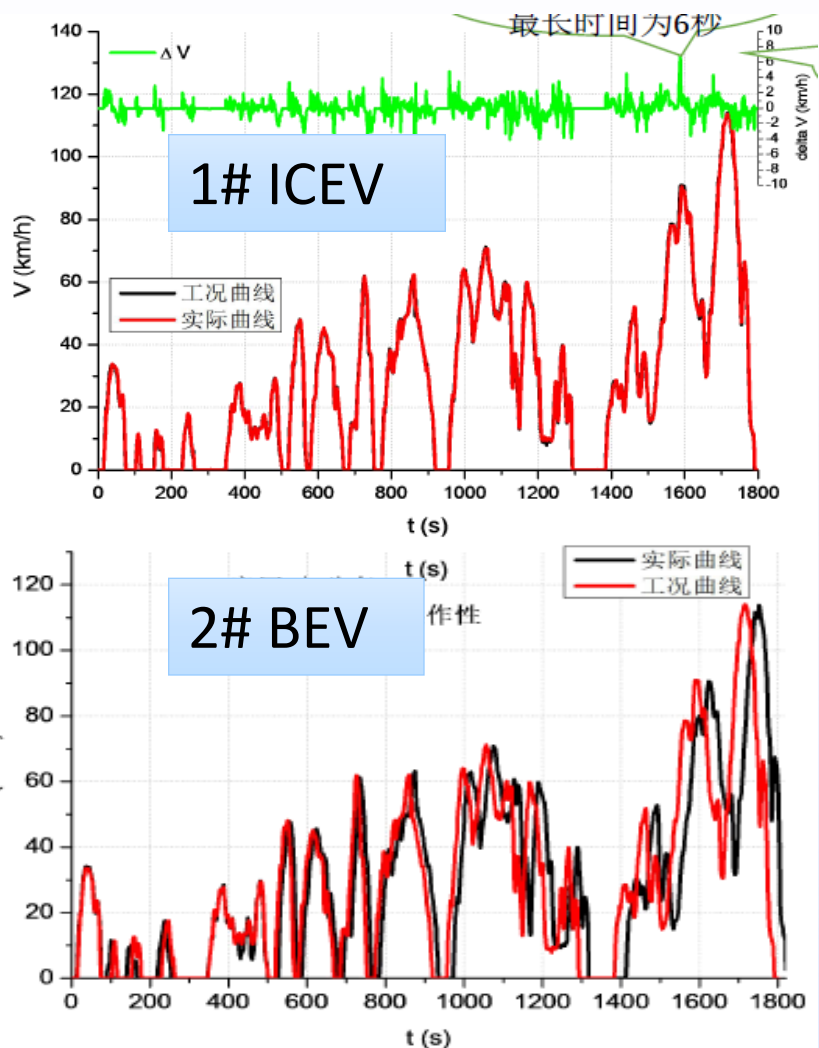
Index	Collected data 采集数据	Collected data weighted by GIS results GIS加权后	NEDC	FTP75	WLTC	CLTC
Ave. speed 平均速度(km/h)	26.47	29.88	33.6	33.9	46.4	28.97
			43.5	40.9	53.2	37.19
Ave. acc. 平均加速度 (m/s ²)	0.48	0.48	0.53	0.62	0.53	0.45
Ave. dec. 平均减速度 (m/s ²)	-0.53	-0.53	-0.75	-0.71	-0.58	-0.5
RPA 相对正加速度 (m/s ²)	0.18	0.17	0.11	0.17	0.15	0.17
Acc. Ratio 加速比例(%)	27.74	29.14	23.2	31.1	30.9	28.67
Dec. ratio 减速比例(%)	25.53	26.40	16.6	27.1	28.6	26.39
Cruise ratio 匀速比例(%)	21.35	22.41	37.5	24.7	27.8	22.83
Idling ratio 怠速比例(%)	25.38	22.05	22.6	17.2	12.7	22.11





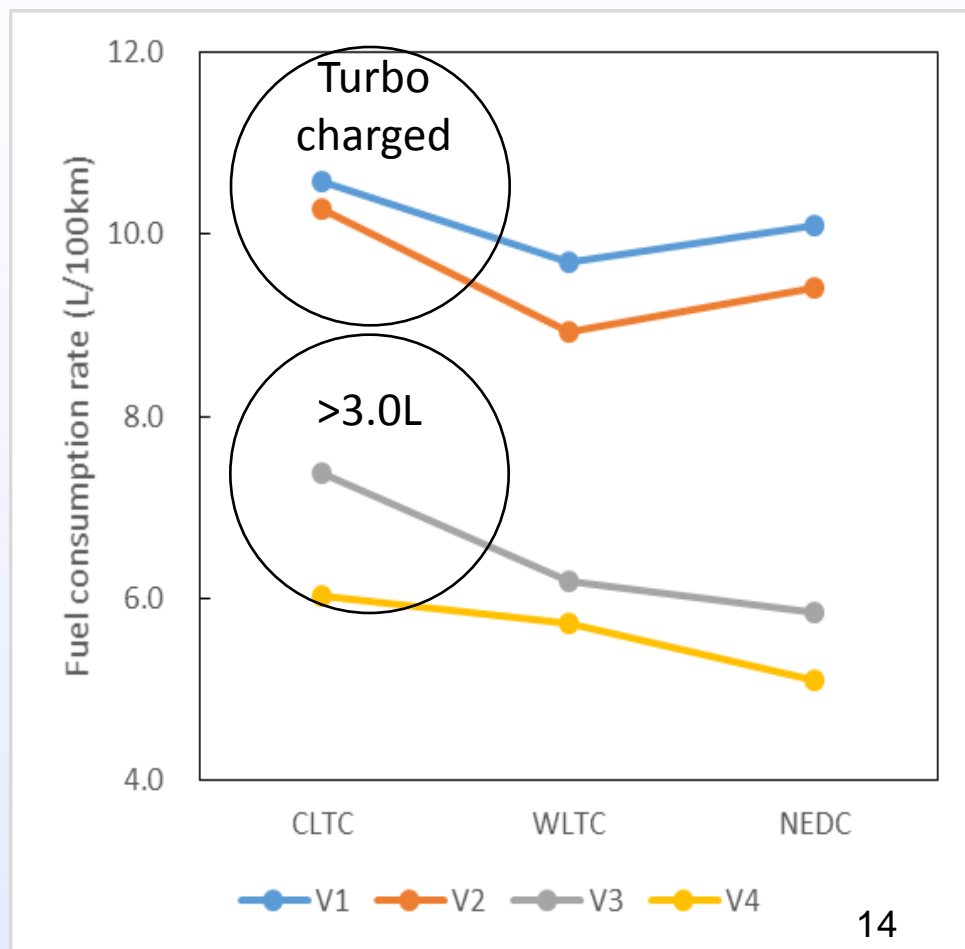
Cycle Validation

Operability Validation



Impact of Cycle:

Tests among CATC/WLTC/NEDC





Future Plan

- Validation and final design of CATC
- Impacts of the fuel consumption limits and policies in terms of the new CATC
- Discussion of the CATC application in both fuel consumption and emission standards



Thanks!