

# WESTERN CAPE

## LAND & WATER USE



**TABLE 1**

Areas and percentage change of land cover groups between 1990 and 2013/14.

Land cover group	1990 Area (km <sup>2</sup> )	2013-14 Area (km <sup>2</sup> )	Change (%)
Waterbodies (WB)	433	439	0.006
Wetlands (WTL)	1128	849	-0.274
Indigenous Forest (INF)	439	444	0.005
Thicket / Dense bush (TDB)	4653	6268	1.584
Woodland / Open bush (WOB)	1327	4169	2.786
Grassland (GRS)	552	4046	3.425
Low shrubland (LSB)	20066	22726	2.608
Mines (MNS)	48	73	0.024
Bare non-vegetated (BNV)	21260	17166	-4.014
Plantations / Woodlots (PWD)	950	643	-0.302
Cultivated commercial annuals (CCA)	13384	13377	-0.007
Cultivated perennial (CPE)	1871	2035	0.161
Cultivated subsistence (CSB)	8	6	-0.002
Shrubland fynbos (SHF)	35069	28845	-6.102
Urban	814	917	0.101

### WARMS DATABASE (updated up to August 2016; excluding Breede-Gouritz Water Management Area)

Most water volumes are registered in the Western Cape for taking water for taking water (1.35 billion m<sup>3</sup> a<sup>-1</sup>), storing water (0.50 billion m<sup>3</sup>), disposal of waste (0.16 billion m<sup>3</sup> a<sup>-1</sup>) and discharging wastewater (0.13 billion m<sup>3</sup> a<sup>-1</sup>).

By water resource types, water is taken mainly from water schemes (41.9%), rivers/streams (39.8%) and boreholes (13.9%).

The highest water withdrawals per sector were for agricultural irrigation (0.95 billion m<sup>3</sup> a<sup>-1</sup> or 70.5% of the total) and urban industry (0.37 billion m<sup>3</sup> a<sup>-1</sup> or 27.2%), besides water supply services.

The Western Cape is the second highest province in registered industrial water use and discharging wastewater associated with urban areas and industry.

Within the Breede-Gouritz Water Management Area, more wastewater is re-used for irrigation, more water is abstracted from rivers/streams and less water is used for urban industry compared to the rest of the province.

### NATIONAL LAND COVER (NLC) MAPS of 1990 & 2013/14:

The largest areas in the Western Cape are covered by shrubland fynbos (28,845 km<sup>2</sup>), low shrubland (22,726 km<sup>2</sup>), bare non-vegetated land (17,166 km<sup>2</sup>) and cultivated commercial annuals (13,377 km<sup>2</sup>) (Figure 1).

Major changes in land cover were recorded between 1990 and 2013/14 with increases in grassland (+3.425%), woodland/open bush (+2.786%), low shrubland (+2.608%), and thicket/dense bush (+1.584%) and shrinking areas of shrubland fynbos (-6.102%) and bare non-vegetated land (-4.014%) (Table 1).

### ETLOOK ANNUAL EVAPOTRANSPIRATION (ET) DATA (from August 2014 to July 2015):

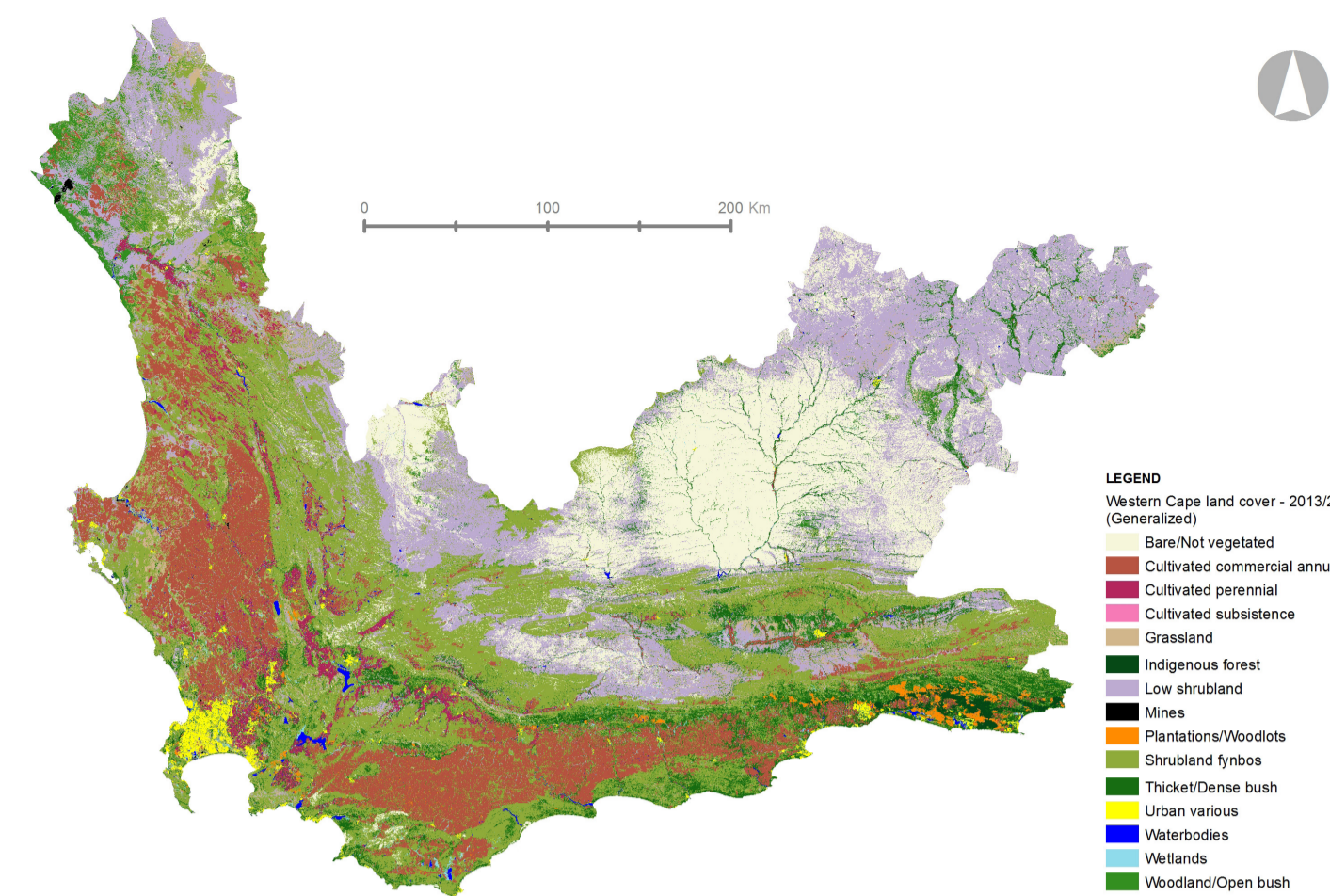
ET is variable depending on geographic position, climate and land cover (Figure 2).

Besides waterbodies, the highest median annual water use per unit area was from indigenous forest (943 mm a<sup>-1</sup>), plantations/woodlots (714 mm a<sup>-1</sup>) and cultivated perennials (554 mm a<sup>-1</sup>), and the lowest from bare non-vegetated land (22 mm a<sup>-1</sup>) (Table 2).

In absolute terms, the largest water use was from shrubland fynbos (9,090 Mm<sup>3</sup> a<sup>-1</sup>), cultivated commercial annuals (4,892 Mm<sup>3</sup> a<sup>-1</sup>), thicket/dense bush (2,776 Mm<sup>3</sup> a<sup>-1</sup>) and low shrubland (2,771 Mm<sup>3</sup> a<sup>-1</sup>).

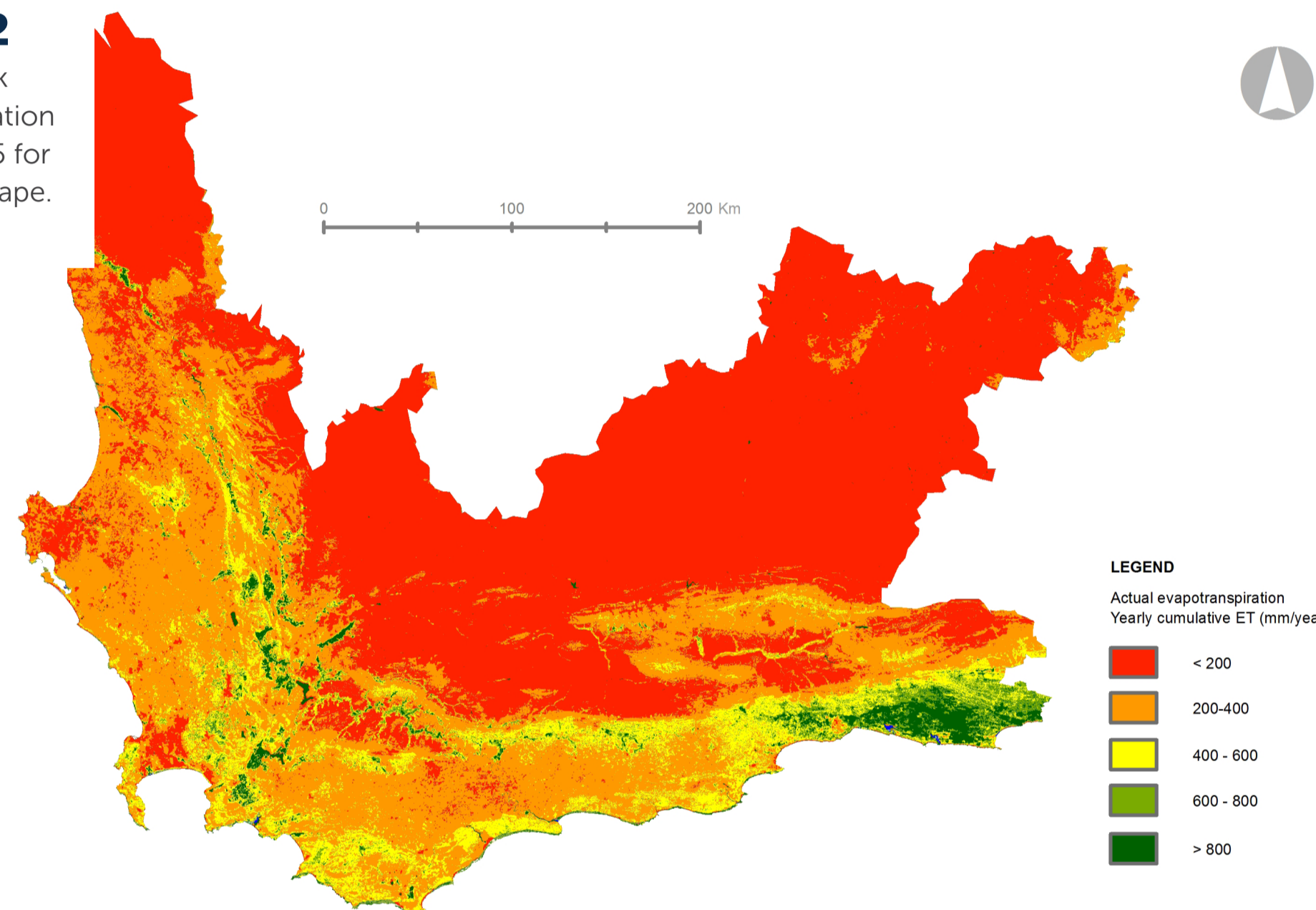
**FIGURE 1**

Land cover groups based on the National Land Cover (NLC) map of 2013/14 for the Western Cape.



**FIGURE 2**

Annual ETLook evapotranspiration (ET) in 2014/15 for the Western Cape.



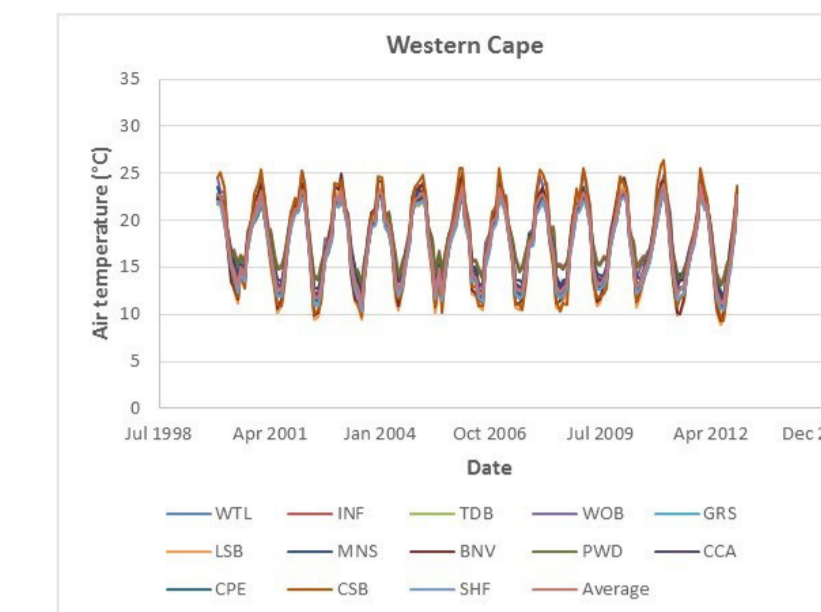
**TABLE 2**

Water use statistics for land cover groups based on annual ETLook data in 2014/15 for the Western Cape.

Land use	Water use statistics						
	MEAN mm (a <sup>-1</sup> )	MEDIAN (mm a <sup>-1</sup> )	MIN (mm a <sup>-1</sup> )	MAX (mm a <sup>-1</sup> )	STD (mm a <sup>-1</sup> )	AREA (km <sup>2</sup> )	CUM (Mm <sup>3</sup> a <sup>-1</sup> )
Waterbodies (WB)	1045	1446	10	2370	709	528	764
Wetlands (WTL)	403	354	10	2368	268	1063	376
Indigenous Forest (INF)	908	943	64	1638	114	557	525
Thicket / Dense bush (TDB)	369	357	10	2361	228	7775	2776
Woodland / Open bush (WOB)	191	142	10	2370	156	5281	752
Grassland (GRS)	242	226	10	2368	135	5130	1160
Shrubland fynbos (SHF)	267	250	10	2370	142	36317	9090
Low shrubland (LSB)	110	96	10	2370	72	28973	2771
Cultivated commercial annuals (CCA)	303	290	10	2237	126	16886	4892
Cultivated perennial (CPE)	592	554	10	2056	269	2575	1427
Cultivated subsistence (CSB)	193	175	63	1872	121	7	1
Cultivated cane (CC)	-	-	-	-	-	-	-
Plantations / Woodlots (PWD)	689	714	19	1920	235	804	574
Mines (MNS)	156	134	10	1931	141	92	12
Bare non-vegetated (BNV)	42	22	10	2370	68	19083	419
Urban industrial (UIIND)	202	179	35	1781	110	87	16
Urban commercial (UC)	206	155	16	1812	162	80	12
Urban residential (UR)	186	158	13	1872	109	215	34
Urban sport and recreation (ORS)	245	213	10	1829	138	465	99
Urban informal (UIINF)	364	304	10	1957	228	125	38
Urban Others (UO)	290	245	11	2117	190	139	34

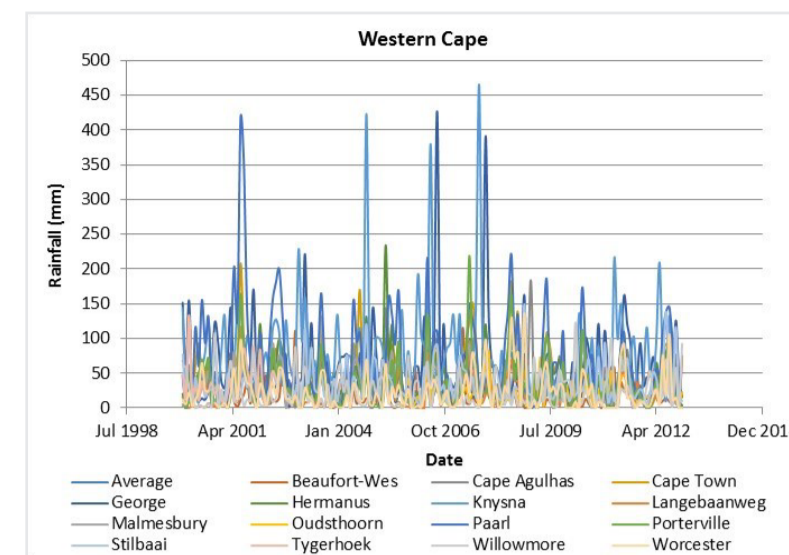
**FIGURE 3**

Daily average air temperatures for different land covers in the Western Cape based on NASA/GMAO Modern Era Retrospective Analysis (MERRA) from 2000 to 2012.



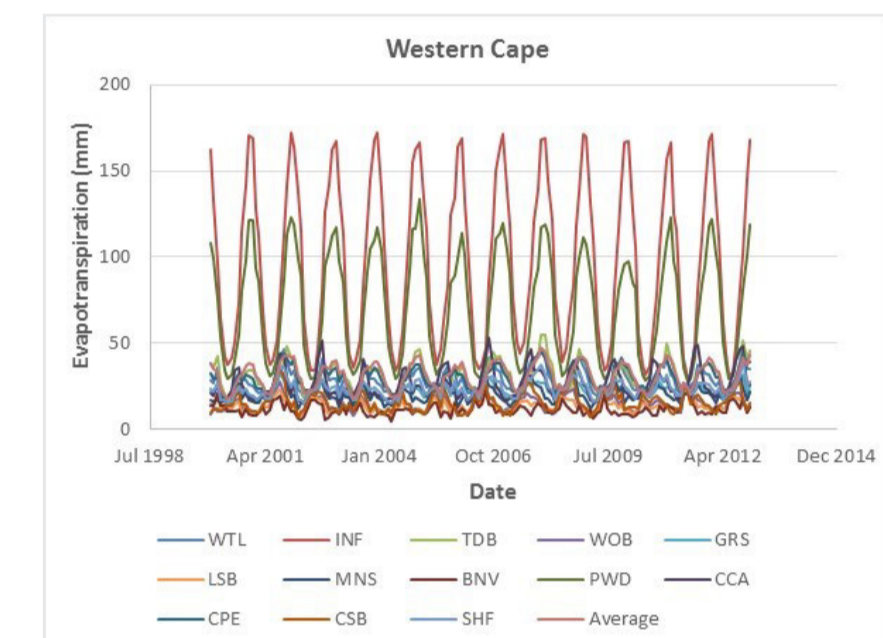
**FIGURE 4**

Monthly rainfall at representative stations in the Western Cape (South African Weather Services) from 2000 to 2012.



**FIGURE 5**

Monthly MOD16 evapotranspiration for different land cover groups in the Western Cape from 2000 to 2012.



### MOD16 MONTHLY EVAPOTRANSPIRATION (ET) DATA (FROM 2000 TO 2012)

- Daily average air temperatures in the Western Cape are rather uniform amongst land covers ranging from about 10°C to 25°C (Figure 3).
- Monthly rainfall exhibits very large variations depending on geographical and climatic conditions, and associated land cover group (Figure 4).
- MOD16 ET covers a very wide range depending on geographic position, climate and associated land cover, ranging from about 10 mm month<sup>-1</sup> during summer up to peaks of 170 mm month<sup>-1</sup> in areas of indigenous forests and 120 mm month<sup>-1</sup> in plantations/woodlots during winter (Figure 5).

### GUIDELINES AND RECOMMENDATIONS

- Agriculture is the dominant water user; incentivizing smart farming practices may reduce the volumes used in agriculture and hence reduce the burden on water resources.
- Increased industrial development will likely impact on industrial water use. Discharging wastewater and disposing waste are substantial water uses due to industrial activities.
- The Breede-Gouritz Water Management Area is the region with the highest volumes of irrigation with wastewater (10.9% of water abstracted) - 7 times higher than the volume of wastewater discharged.
- However, there is scope for more water-reuse (currently 1.1% of water abstracted in the province is re-used for wastewater irrigation).
- The limited use of boreholes leaves scope for increased groundwater use as well as conjunctive use of surface water and groundwater.
- Non-commercial and non-conservation land under vast thicket/dense bush, woodland/open bush, grassland and low shrubland can be traded off to reduce water use. Conservation efforts need to be strengthened to prevent loss of shrubland fynbos and wetlands. A strong decline of bare nonvegetated land was recorded; this, however, puts more pressure on water resources. Plantations/woodlots are slightly declining, which relieves some pressure on water resources.

#### ACKNOWLEDGMENTS AND SOURCES OF INFORMATION:

Water Authorisation and Registration Management System (WARMS)  
National Land Cover (NLC) maps for 1990 and 2013/14  
Satellite-derived images and products (ETLook and MOD16 evapotranspiration)  
Ground measurements of climatic variables (SAWS)  
NASA/GMAO Modern Era Retrospective Analysis (MERRA)



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