

We present a new geomagnetic model over the span from 2014.0 to 2024.5 called MSCM: a model defined by using vector and scalar data from the Swarm, CSES, and MSS-1 missions.

MSCM incorporates contributions from the core, lithospheric, and magnetospheric fields. The core field is represented by a series of snapshot models with spherical harmonic coefficients up to degree and order 15, covering the period from 2014.0 to 2024.5. The lithospheric field is modeled as a static snapshot, with spherical harmonic coefficients extending up to degree 40. The magnetospheric field is described by spherical harmonic coefficients up to degree and order 2, with only the first-order coefficient varying over time, updated every 30 days from November 25, 2013, to September 27, 2024.

Table1 Format of Core field model

degree	order	t(1)	t(2)	t(3)	...	t(n_times)
1	0	$g_1^0(1)$	$g_1^0(2)$			$g_1^0(n\_times)$
1	1	$g_1^1(1)$	$g_1^1(2)$			$g_1^1(n\_times)$
1	-1	$h_1^1(1)$	$h_1^1(2)$			$h_1^1(n\_times)$
...	...	...	...			...
n	m	$g_n^m(1)$	$g_n^m(2)$			$g_n^m(n\_times)$
n	-m	$h_n^m(1)$	$h_n^m(2)$			$h_n^m(n\_times)$
...	...	...	...			...
15	15	$g_{15}^{15}(1)$	$g_{15}^{15}(2)$			$g_{15}^{15}(n\_times)$
15	-15	$h_{15}^{15}(1)$	$h_{15}^{15}(2)$			$h_{15}^{15}(n\_times)$

Table2 Format of lithospheric field model

degree	order	
16	0	$g_{16}^0$
16	1	$g_{16}^1$
16	-1	$h_{16}^1$

...	...	...
n	m	$g_n^m$
n	-m	$h_n^m$
...	...	...
40	40	$g_{40}^{40}$
40	-40	$h_{40}^{40}$

Table3 Format of magnetospheric field model

degree	order	t	
1	0	t(1)	$\Delta q_1^0(1)$
1	0	t(2)	$\Delta q_1^0(2)$
...	...	...	...
1	0	t(n_times)	$\Delta q_1^0(n\_times)$
1	1	t(1)	$\Delta q_1^1(1)$
1	1	t(2)	$\Delta q_1^1(2)$
...	...	...	...
1	1	t(n_times)	$\Delta q_1^1(n\_times)$
1	-1	t(1)	$\Delta s_1^1(1)$
1	-1	t(2)	$\Delta s_1^1(2)$
...	...	...	...
1	-1	t(n_times)	$\Delta s_1^1(n\_times)$
1	0		$\hat{q}_1^0$
1	1		$\hat{q}_1^1$
1	-1		$\hat{s}_1^1$

2	0		$q_2^0$
2	1		$q_2^1$
2	-1		$s_2^1$
2	2		$q_2^2$
2	-2		$s_2^2$
1	0		$q_1^{0,GSM}$
2	0		$q_2^{0,GSM}$