Supplementary Information

Table SI1. Bacterial emission fluxes (best-fit) estimated by Burrows et al. (2009a).

Ecosystem	Best-fit F_i ($m^{-2}s$-1)
Coastal	900
Crops	700
Deserts	0
Forests	0
Grasslands	648
Land-Ice	0
Sea	0
Shrubs	502
Tundra	0
Wetlands	196

Bacterial emission fluxes are calculated using the best-estimate values from (Burrows et al., 2009) for different ecosystems, which were optimized toward overall agreement with observation-based near-surface number concentrations (see Table SI1). We used the MODIS International Global Biosphere Program (IGBP) global land cover classification to determine the spatial distribution of 18 different ecosystems. We lumped the categories defined in the MODIS classifications to match similar sets of lumped ecosystems used by (Burrows et al., 2009) (i.e., derived from the Olson ecosystem types), with the exception of the "urban" ecosystem, which is only present in MODIS data. We used a geometric mean diameter for bacteria of 4 µm for continental sources (forests, shrubs, grasslands, wetlands, savannahs and urban ecosystems) and 2.4 µm for marine sources. These choices are based on values reported for the count median diameter of bacteria-carrying particles, which may include bacteria borne by larger particles such as dust and leaf litter and/or clumps of bacteria (Shaffer and Lighthart, 1997; Tong and Lighthart, 2000, 1999; Wang et al., 2007).

Table SI2: List of the fungal spores counts (in m^{-3})

Reference	LON	LAT	ALT	startdate	enddate	Mean	Min	Max	Reference
AM05	2,95	45,76	1465	04.03.2003	06.03.2003	222	53	390	(Amato et al., 2005)
BA02	15,76	47,71	1644	01.03.2000	30.03.2000	773	104	2031	(Bauer et al., 2002)
BE85	6,6	53,16	5	01.01.1981	31.12.1983	258	42	1225	(Beaumont et al., 1985)
CO08	-73,75	45,46	0	16.10.2002	16.10.2002	615	492	738	(Côté et al., 2008)
DA63_1	-0,11	51,5	64	01.06.1961	31.10.1961	7500	2000	13000	(Davies et al., 1963)
DA63_2	-2,98	53,4	92	01.06.1961	31.10.1961	9000	3000	15000	(Davies et al., 1963)
DIG96	5,36	43,28	0	01.01.1962	31.12.1962	69	3	411	(Di Giorgio et al., 1996)
EL07	-59,4	-1,91	174	21.07.2001	21.07.2001	12476	4764	20188	(Elbert et al., 2007)
FI90	14,41	50,08	0	01.10.1988	15.12.1988	17	NA	NA	(Fišar et al., 1990)
DR66	7,63	11,18	690	01.07.1959	30.07.1959	128	20	237	(Dransfield, 1966)
GON10	-46,63	-23,55	0	01.03.2007	31.03.2007	3768	NA	NA	(Goncalves et al., 2010)
BARD13	-5,36	35,56	250	01.01.2009	31.12.2012	1434	177	12082	(Bardei et al., 2013)
KAS_1	22	50,03	0	01.01.2001	31.12.2002	2163	NA	NA	(Kasprzyk and Worek, 2006)
KAS_2	22,08	50,03	0	01.04.2001	31.12.2002	2119	NA	NA	(Kasprzyk and Worek, 2006)
MA01_1	18,8	54,6	0	01.01.1998	31.03.1998	105	0	1000	(Marks et al., 2001)
MA01_2	18,8	54,6	0	01.07.1998	30.09.1998	223	0	600	(Marks et al., 2001)
MA01_3	18,85	54,52	0	02.08.1995	17.09.1995	19	0	122	(Marks et al., 2001)
OLI09_1	-8,38	41,51	5	01.01.2005	31.12.2007	934	NA	NA	(Oliveira et al., 2009)
OLI09_2	-8,65	41,18	20	01.01.2005	31.12.2007	531	NA	NA	(Oliveira et al., 2009)
RO05_2	-7,85	42,33	0	01.01.2002	31.12.2002	964	NA	NA	(RodrÍGuez-Rajo et al., 2005)
GRIF_01	-64,73	18,33	0	01.07.2000	30.07.2000	45	30	60	(Griffin et al., 2001)
GRIF_03	-64,79	18,33	0	18.07.2000	08.08.2001	21,24	18,25	61	(Griffin et al., 2003)
GRIF_07	34,25	36,6	0	18.03.2002	22.10.2002	1702	100	8510	(Griffin et al., 2007)
LAU06	114,26	22,33	0	01.09.2002	30.04.2003	269,5	28,5	1963	(Lau et al., 2006)
KAT97	-104,86	39,75	0	01.01.1987	31.12.1995	409	NA	NA	(Katial et al., 1997)
PAD57_1	-96,56	39,18	0	01.04.1953	30.10.1953	24499	837	48162	(Pady, 1957)
PAD57_2	-96,56	39,18	0	01.12.1953	30.03.1954	715	170	1261	(Pady, 1957)
LEV06	-95,93	36,11	0	01.01.2002	31.12.2002	24121	53	48188	(Levetin and Dorsey, 2006)
MAL10_1	-57,95	-34,91	15	01.07.2000	15.09.2000	284	NA	2000	(Mallo et al., 2010)
MAL10_2	-57,95	-34,91	15	15.09.2000	15.12.2000	395	NA	2000	(Mallo et al., 2010)
MAL10_3	-57,95	-34,91	15	15.12.2000	15.03.2001	814	NA	3478	(Mallo et al., 2010)
MAL10_4	-57,95	-34,91	15	15.03.2001	30.06.2001	715	NA	4763	(Mallo et al., 2010)
SAB00	-3,58	37,18	0	01.01.1994	31.12.1994	832	NA	NA	(Sabariego et al., 2000)
SAK03	32,86	39,93	15	01.01.1990	31.12.1990	2917	17	5817	(Şakiyan and Inceoğlu, 2003)
HAM59	-0,35	51,81	0	04.05.1954	30.09.1954	11500	6400	10000	(Hamilton, 1959)

WU07	121,1	25,05	0	01.03.2003	31.12.2004	2255	NA	NA	(Wu et al., 2007)
WU04	120,2	23	0	01.12.2000	30.04.2001	28683	NA	NA	(Wu et al., 2004)
KE04	-8	12,65	0	01.02.2001	31.03.2001	225	80	370	(Kellogg et al., 2004)
CHO97	127,38	36,35	0	01.01.1995	31.12.1995	3014	100	5929	(Choi et al., 1999)
HO15	121,6	23,96	0	01.04.1993	31.03.1996	4839	NA	NA	(Ho et al., 2005)
AB14	36,1	32,01	0	01.12.2008	30.09.2009	7541	3066	12017	(Abu-Dieyeh et al., 2010)
PY14	23,71	37,98	30	01.01.1998	31.12.2001	1055	60	6328	(Pyrri and Kapsanaki-Gotsi, 2015)
RO90	-99,18	19,31	0	01.08.1988	28.02.1989	351	45	3195	(Rosas et al., 1990)
EL13	-0,98	37,6	0	01.01.1994	31.12.1999	655	10	1301	(Elvira-Rendueles et al., 2013)
HAS12	67	24,85	0	01.01.2010	31.12.2010	310	157	469	(Hasnain et al., 2012)
HE06	-3,75	40,45	0	01.01.2003	31.12.2003	609	166	1614	(Herrero et al., 2006)
WI09	16,36	48,2	0	01.01.2002	31.12.2002	49	NA	NA	(Winiwarter et al., 2009)
ABD12	31,55	29,86	0	01.01.2006	29.02.2007	216	101	331	(Abdel Hameed et al., 2012)
HU05	116,38	39,91	0	01.06.2003	30.05.2004	1164	23	13959	(Fang et al., 2005)
ZHA00	118,76	32,05	0	21.03.1998	14.07.1998	655	NA	NA	(Zhai et al., 2000)
HU94	123,06	41,13	0	01.12.1990	30.11.1991	1797	NA	NA	(Hu et al., 1994)
JO83	-77,33	39,23	0	01.09.1978	01.12.1980	695	4	6885	(Jones and Harrison, 2004)
KA10	27,41	38,61	74	01.01.2004	31.12.2005	541	415	780	(Kalyoncu, 2010)
AD03	88,16	22,66	10	01.10.1996	30.09.1998	879	119	1639	(Adhikari et al., 2004)

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