

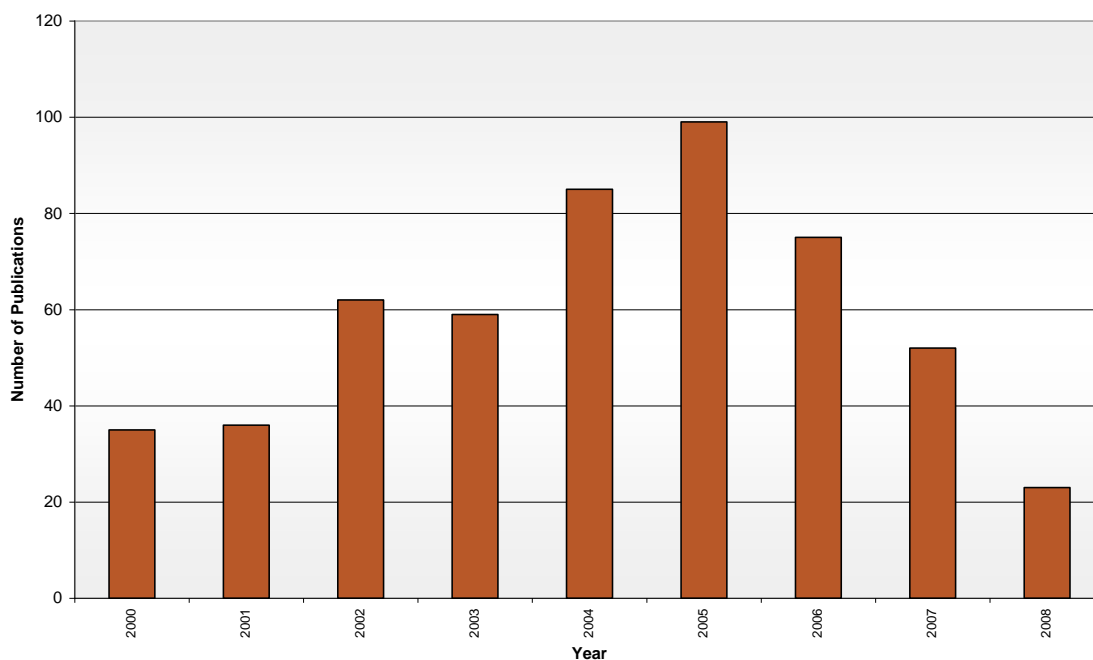
Particulate Matter Research Centers: Publication Analysis Summary

Since EPA's Particulate Matter (PM) Research Center program was established in 1999, it has been highly productive in terms of publications. This analysis will primarily focus on the first set of Centers, funded from 1999-2005. These Centers have so far produced 526 publications, of which 503 are journal articles, and the remaining 23 are book chapters and reports.

Figure 1 shows the number of publications produced by the 1999-2005 PM Centers by year of publication. Although the Centers received their final year of funding in 2005, the peak of publication was not reached until that year, and well over 100 publications were produced in the next few years. It is worth noting that while the production rate has slowed down somewhat, publications attributable to the first set of Centers are still being produced.

Figure 1. 1999-2005 PM Center Publications by Year of Publication.

Publications peaked toward the end of the grant, and are still being produced.



Diversity of Research Output

In addition to producing a large number of publications, the PM Centers achieved considerable breadth in the journals in which their findings appeared. The diversity of research output is important because the more widespread the readership, the greater the potential interest in the topic. The 503 articles produced thus far were published in 101 different journals, listed in Appendix 1. The subject matter of these journals represented health and atmospheric science fairly evenly, in addition to a few focusing on statistics and urban affairs.

Table 1 shows the top ten journals in which PM Center findings have been published. While a wide variety of journals have published PM Center work, the majority (63%) of articles appeared in the journals listed below.

Table 1. Top 10 Journals Where PM Center Papers are Published

PM Center publications have considerable breadth in their scientific relevance as well as depth in their subjects of focus.

Journal Title	Number of Publications
Environmental Health Perspectives	74
Inhalation Toxicology	52
Atmospheric Environment	44
Aerosol Science and Technology	34
Environmental Science and Technology	26
Journal of the Air and Waste Management Association	23
Epidemiology	19
Journal of Exposure Science and Environmental Epidemiology	17
Journal of Aerosol Science	16
American Journal of Respiratory and Critical Care Medicine	11
Total publications in top 10 journals	316
Publications in other journals	187
Total journal publications	503
Total overall publications (incl. book chapters and reports)	526

According to a bibliometric analysis performed in September 2007, about 40% of PM Center publications have appeared in the top 10% of journals by impact, or importance to their field. High impact scientific and medical journals publishing PM Center work, such as the *New England Journal of Medicine*, *Science*, *Lancet*, *Circulation*, and the *Journal of the American Medical Association*, are highlighted in Table 2.

Table 2. Number of PM Center Papers in the Top 200 High Impact Journals

PM Center publications are regularly published in highly influential journals.

Journal Title	JCR Rank of Journal¹	1999 Center Publications	2005 Center Publications
New England Journal of Medicine	2	2	
Science	9	3	
Lancet	18	3	
Journal of the American Medical Association	23	3	2
Circulation	88	8	1
Nano Letters	110		1
Proceedings of the National Academy of Sciences	116	1	
American Journal of Respiratory and Critical Care Medicine	131	11	2
Journal of Allergy and Clinical Immunology	136	3	1
Cancer Research	172	1	

¹ Thomson Reuters' Journal Citation Reports (JCR). Information at <http://scientific.thomson.com/products/jcr>.

Influence of Research Output

PM Center findings have been cited by a variety of organizations, both to inform various audiences about PM and its effects and as evidence in establishing standards and creating policy. For example, the American Heart Association issued a scientific statement on air pollution and cardiovascular disease, reviewing the literature and addressing the public health indications for clinicians and policy implications for regulators. Of the statement's 108 recent citations (since 2000), which include international sources, 18 (or 16.7%) were PM Center papers. PM Center findings have been used internally by EPA in its review of the PM National Ambient Air Quality Standards (NAAQS). The last PM NAAQS proposal was based on a review of the science that ended in 2004. Given the number of new studies published too recently to be included, EPA screened and surveyed the recent literature and developed a provisional assessment that places those studies of potentially greatest relevance in the context of the findings of the 2004 science review. This was completed in 2006 prior to issuing the final PM NAAQS. Of the 215 national and international citations in this PM provisional assessment, 71 (or 33%) were PM Center papers.

Examples of other organizations citing PM Center work include the American Academy of Pediatrics, the American Lung Association, and the Northeast States for Coordinated Air Use Management. Local and state agencies including the South Coast Air Quality Management District, the California Air Resources Board, and the Virginia State Advisory Board on Air Pollution, and international agencies like the World Health Organization and the United Nations Environmental Programme have also cited its research. Appendix 2 details these citations.

Several PM Center papers have emerged as influential in their fields, as measured by their citation rate. These are summarized in Table 3, below, and a full list is in Appendix 3. A bibliometric analysis of ORD Air Program publications performed in September 2007 indicated that PM Center research is cited much more often than statistically expected. For example, about 37% of PM Center papers fall in the top 10% in terms of overall citation rate – about 3.7 times as many as expected. Even more dramatically, 6% of PM Center papers are in the top 1%, or 6 times as many as expected; and 3% are in the top 0.1%, or 30 times as many as expected.

Table 3. Number of Highly Cited 1999-2005 PM Center Papers by Field (top 1%)

Highly cited 1999-2005 PM Center papers are found in several different scientific fields.

ESI Field ²	No. of Citations	No. of Papers	Average Cites/Paper
Clinical Medicine	1110	6	185.0
Economics/Business	7	1	7.0
Engineering	291	5	58.2
Environment/Ecology	577	13	44.4
Geosciences	150	2	75.0
Pharmacology/Toxicology	259	2	129.5

² Thomson Reuters' Essential Science Indicators. Information at <http://scientific.thomson.com/products/esi/>.

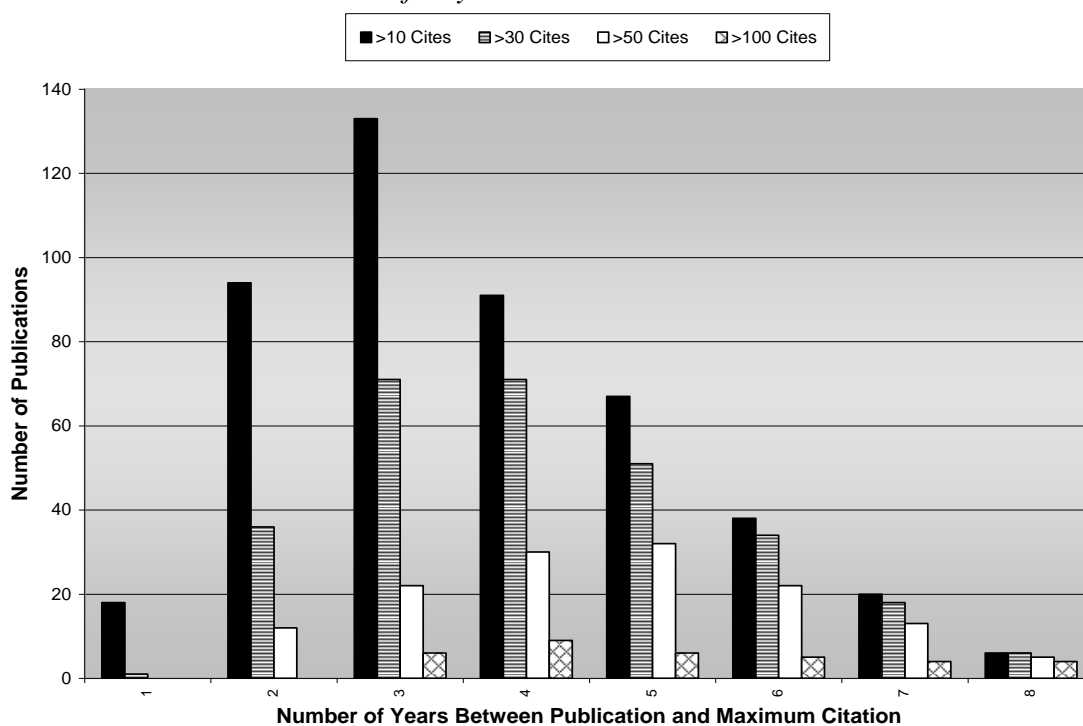
	Total = 2394	Total = 29	Average = 82.6
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Figure 2 presents the delay that occurs between when a scientific paper is published and when it is cited by other studies. The figure presents citation delay data for all publications that the 2007 ORD Air Program bibliometric analysis identified as in the top 10% based on citations for which a peak of maximum citations could be identified.

As seen in Figure 2, the more highly cited a paper becomes, the further back in time its citation delay is pushed. Air publications cited by 10-30 others (in black) peak three years after being published, while those cited by 50-100 (in white) experience a peak citation delay of about five years. Since PM Center papers peaked in publication in 2005, they have not yet reached their peak citation rate and will likely be cited even more in the upcoming few years.

Figure 2. Citation Delay for Highly Cited Air Publications (2007).

Since the PM Centers produced so many highly cited papers, their citation rate will continue to increase over the next few years.



Productivity of PM Center Research

By combining funding data and results of the bibliometric analysis, an attempt was made to assess productivity of the PM Centers. A grant that produces more publications (normalized by dollars) and higher quality publications (measured by bibliometric analysis) is more productive than a grant that produces fewer and lower quality publications. Table 4 presents productivity measures of the PM Centers and grants from 16 other STAR Air RFAs that are completed or nearing completion. Table 4 also shows how productive the PM Centers and other STAR Air RFAs have been, based on proportion of publications per \$100K, top 10% (in terms of citation rate) publications per \$100K, percent of publications in the top 10%, top 1% (in terms of citation

rate) publications per \$100K, and top 0.1% (in terms of citation rate) publications. Table 4 demonstrates that the publication quality, as determined by bibliometrics, of the entire STAR Air Program (including the PM Centers) is well above the expected averages.

Table 4. Productivity of PM Centers and Other STAR Air Programs

The PM Centers and other STAR Air programs are above average in productivity.

	PM Centers (1999-2005)	Other STAR Air Programs (1995-2004)
Cost (Mil. \$) *	49.4	78.9
Total Publications *	526	689
Publications/\$100K	1.07	0.87
Top 10% Publications *	187	200
Top 10% Pubs/\$100K	0.38	0.25
% of Pubs in the top 10% (expected value = 10%)	36%	29%
Top 1% Publications *	28	32
Top 1% Pubs/\$100K	0.06	0.04
% of Pubs in the top 1% (expected value = 1%)	5.3%	4.6%
Top 0.1% Publications *	5	4
% of Pubs in the top 0.1% (expected value = 0.1%)	1.0%	0.6%

* Note that PM Center productivity is measured over 6 years of funding and other STAR Air Program productivity is measured over 9 years of funding.

Analyzing the publications for the second set of PM Centers is more challenging, as these Centers have only recently started producing publications, which are much too new to be cited by others. Already, however, some of these publications have appeared in high-impact journals. Counts of these are presented in Table 2, on page 2, and a full list is included in Appendix 4.

Appendix 1. Distribution of PM Center Paper Publication.³

Periodical	Number	JCR Impact Factor⁴	JCR IF Rank
Not in a periodical	23		
Aerosol Science and Technology	34		
American Heart Journal	1		
American Journal of Cardiology	1	3.02	876
American Journal of Epidemiology	10	5.24	308
American Journal of Industrial Medicine	1		
American Journal of Physiology – Lung, Cellular, and Molecular Physiology	1	4.25	472
American Journal of Public Health	1	3.70	626
American Journal of Respiratory and Critical Care Medicine	11	9.09	131
American Journal of Respiratory Cell and Molecular Biology	2	4.59	412
Analytica Chimica Acta	2		
Analytical Chemistry	1	5.81	260
Analytical Sciences	1		
Anatomical Record	1		
Annals of Allergy, Asthma, and Immunology	2		
Annals of Occupational Hygiene	1		
Antioxidants and Redox Signaling	1	4.49	431
Applied Environmental Science and Public Health	1		
Applied Occupational and Environmental Hygiene	1		
Archives of Environmental Health	2		
Archives of Internal Medicine	1		
Arteriosclerosis, Thrombosis, and Vascular Biology	1		
Atmospheric Environment	44		
Atmospheric Research	1		
Biochimica et Biophysica Acta (BBA) – General Subjects	1		
Biostatistics	5		
Cancer Research	1	7.66	172
Cardiovascular Toxicology	3		
Chemico-Biological Interactions	1		
Chemosphere	1		
Chest	2	3.92	552
Circulation	9	10.94	88
Clinical Immunology	1	3.61	659
Current Opinion in Pulmonary Medicine	1		

³ JCR impact factor and ranking data was available for only the top 10% high impact journals, and is therefore presented in the table above for only those journals.

⁴ JCR impact factor (IF) is a citation analysis metric that allows one to compare the relative importance of a journal, by measuring how often the average article in a journal has been cited in a given year. The higher the IF, the higher the impact of the journal.

Environmental Health Perspectives	74	5.86	255
Environmental Health: A Global Access Science Source 2003	1		
Environmental Health	2		
Environmental Research	3		
Environmental Science and Technology	26	4.04	518
Environmetrics	3		
Epidemiology	19	4.34	452
European Respiratory Journal	1	5.08	335
Experimental Lung Research	4		
Free Radical Biology and Medicine	1		
Human and Ecological Risk Assessment	1		
Inhalation Toxicology	52		
International Archives of Occupational and Environmental Health	1		
International Journal of Biometeorology	1		
International Journal of Cardiology	1		
International Journal of Epidemiology	1	4.51	424
International Journal of Occupational and Environmental Health	2		
International Statistical Review	1		
Journal of Aerosol Medicine	2		
Journal of Aerosol Science	16		
Journal of the Air and Waste Management Association	23		
Journal of Allergy and Clinical Immunology	3	8.83	136
Journal of the American Medical Association	3	23.18	23
Journal of Applied Physiology	2	3.18	807
Journal of Applied Toxicology	1		
Journal of Atmospheric Chemistry	1		
Journal of Environmental Monitoring	2		
Journal of Epidemiology and Community Health	1		
Journal of Exposure Science and Environmental Epidemiology (formerly Journal of Exposure Analysis and Environmental Epidemiology)	17		
Journal of Geophysical Research – D: Atmospheres	8		
Journal of Immunology	4	6.29	223
Journal of Immunotoxicology	3		
Journal of Occupational and Environmental Hygiene	1		
Journal of Occupational and Environmental Medicine	6		
Journal of the Royal Statistical Society Series A	1		
Journal of the Royal Statistical Society Series B	1		
Journal of the Royal Statistical Society Series C	1		
Journal of Thrombosis and Haemostasis	1	5.14	325
Journal of Toxicology and Environmental Health Part A	6		
Journal of Toxicology and Environmental Health Part B	1		
Journal of Urban Affairs	1		

Journal of Urban Health	1		
Lancet	3	25.8	18
Materials Research Society Symposium Proceedings	1		
Mutation Research/Fundamental and Molecular Mechanisms of Mutagenesis	1		
Neurotoxicology	1		
New England Journal of Medicine	2	51.30	2
Nonlinearity in Biology, Toxicology, and Medicine	2		
Occupational and Environmental Medicine	7		
Particle and Fibre Toxicology	1		
Pediatric Annals	1		
Philosophical Transactions of the Royal Society of London Series A	1		
Polycyclic Aromatic Compounds	1		
Proceedings of the National Academy of Sciences	1	9.64	131
Remote Sensing of Environment	1	3.06	855
Respiration Physiology	1		
Risk Analysis	2		
Science	4	30.03	9
Science of the Total Environment	3		
Statistical Science	1		
Statistics in Medicine	3		
Stroke	1	5.39	293
Thorax	3	6.06	237
Toxicological Sciences	8	3.60	662
Toxicology	1		
Toxicology and Applied Pharmacology	3	4.72	392
Transactions in GIS	1		
Umweltmedizin in Forschung und Praxis	2		

Appendix 2. Examples of Outside Agencies and Publications Citing PM Center Research.

American Academy of Pediatrics Committee on Environmental Health. Policy Statement: Ambient Air Pollution: Health Hazards to Children. (2004 Dec 6). *Pediatrics* 114(6):1699-1707.

American Lung Association. (2007). Particle Pollution Fact Sheet. Available online at <http://www.lungusa.org/site/pp.asp?c=dvLUK9O0E&b=50324>.

American Thoracic Society. (2007 May 20). Conference Sessions: A6 Mechanisms of Particulate Matter Induced Mortality. Available online at <http://www.thoracic.org/sections/meetings-and-courses/international-conference/past-conferences/2007/conference-program/conference-sessions/detail.cfm?s=A06>.

Brook RD, Franklin B, Cascio W, Hong Y, Howard G, Lipsett M, Luepker R, Mittleman M, Samet J, Smith SC, Tager I. (2004 Jun 1). Air Pollution and Cardiovascular Disease: A Statement for Healthcare Professionals from the Expert Panel on Population and Prevention Science of the American Heart Association. *Circulation* 109:2655-2671.

California Air Resources Board. (2002). Public Hearing to Consider Amendements to the Ambient Air Quality Standards for Particulate Matter and Sulfates. Available online at <http://www.arb.ca.gov/research/aaqs/std-rs/pm-final/pm-final.htm>.

California Air Resources Board and American Lung Association. (2004 Jan). Recent Research Findings: Health Effects of Particulate Matter and Ozone Air Pollution. Available online at <http://www.arb.ca.gov/research/health/fs/PM-03fs.pdf>.

California Air Resources Board. (2006). Health Effects of Diesel Exhaust Particulate Matter. Available online at http://www.arb.ca.gov/research/diesel/dpm_draft_3-01-06.pdf.

California Air Resources Board. (2008). Methodology for Estimating Premature Deaths Associated with Long-term Exposures to Fine Airborne Particulate Matter in California. Available online at <http://www.arb.ca.gov/Research/Health/pm-mort/pm-mortdraft.pdf>.

Environmental Protection Agency, Office of Research and Development, National Center for Environmental Assessment. (2006 July). *Provisional Assessment of Recent Studies on Health Effects of Particulate Matter Exposure*. Available online at http://www.epa.gov/particles/pdfs/ord_report_20060720.pdf.

Health Effects Institute. (2004 Apr). Special Report 15: Health Effects of Outdoor Air Pollution in Developing Countries of Asia: A Literature Review. Available online at <http://pubs.healtheffects.org/getfile.php?u=13>.

Johnson P, Miller PJ (NESCAUM/NESCCAF). (2007 Feb 5). Ultrafine Particles: Issues Surrounding Diesel Retrofit Technologies for Particulate Matter Control. Available online at <http://www.nescaum.org/documents/ufp-white-paper-20070205-final.pdf>.

New Jersey Department of Environmental Protection. (2006 Dec 18). Proposal for Diesel Retrofit Program. Available online at <http://www.nj.gov/dep/aqm/Diesel%20Retrofit%20Program%20Rule%20Proposal.pdf>.

New York State Energy Research and Development Authority (NYSERDA). (2007 Aug). Environmental Research and Monitoring Needs in New York State: A Multi-Year Research Plan for the New York State Energy Research and Development Authority's Environmental Monitoring, Evaluation, and Protection Program. Available online at <http://www.nyserda.org/environment/emep/emeplan2007.pdf>.

Netherlands Environmental Assessment Agency. (2005). Particulate matter: a closer look; The state of affairs in the particulate matter dossier from a Dutch perspective. Available online at <http://rivm.openrepository.com/rivm/bitstream/10029/7368/1/500037011.pdf>.

Northeast States for Coordinated Air Use Management. (2008 Jan 15). Public Health Benefits of Reducing Ground-level Ozone and Fine Particle Matter in the Northeast U.S.: A Benefits Mapping and Analysis Program (BENMAP) Study. Available online at http://www.nescaum.org/documents/benmap_report_1-16-08.pdf.

Rochester DF. (2006 Nov). Outdoor Air Pollution, Health, and Health Costs in Virginia. Available online at http://beta.deq.virginia.gov/export/sites/default/air/sab/SABAP_Rochester_Rpt.doc.

South Coast Air Quality Management District. (2004 Dec). Recent Studies on the Health Effects from Air Pollution. Available online at <http://www.aqmd.gov/pubinfo/Publications/collaterals/HealthEffects.pdf>.

United Nations Environment Programme GEO: Global Environment Outlook. (2005). Toxic Releases. Available online at <http://www.unep.org/geo/yearbook/yb2004/051.htm>.

Appendix 3. List of Highly Cited (Top 1%) Publications from the PM Center Program

# of Cites- Sep 2007	First Author	Paper	Journal Field
634	Pope CA	Lung cancer, cardiopulmonary mortality and long-term exposure to fine particulate air pollution. <i>Journal of the American Medical Association</i> 2002;287(9):1132-1141.	Clinical Medicine
249	Peters A	Increased particulate air pollution and the triggering of myocardial infarction. <i>Circulation</i> 2001;103(23):2810-2815.	Clinical Medicine
157	Oberdorster G	Pulmonary effects of inhaled ultrafine particles. <i>International Archives of Occupational and Environmental Health</i> 2001;74(1):1-8.	Pharmacology/ Toxicology
144	Li N	Ultrafine particulate pollutants induce oxidative stress and mitochondrial damage. <i>Environmental Health Perspectives</i> 2003;111(4):455-460.	Environment/Ecology
133	Oberdorster G	Nanotoxicology: an emerging discipline evolving from studies of ultrafine particles. <i>Environmental Health Perspectives</i> 2005;113(7):823-839.	Environment/Ecology
131	Pope CA	Cardiovascular mortality and long-term exposure to particulate air pollution: epidemiological evidence of general pathophysiological pathways of disease. <i>Circulation</i> 2004;109(1):71-77.	Clinical Medicine
130	Zhu YF	Concentration and size distribution of ultrafine particles near a major highway. <i>Journal of the Air & Waste Management Association</i> 2002;52(9):1032-1042.	Engineering
121	Zhu Y	Study of ultrafine particles near a major highway with heavy-duty diesel traffic. <i>Atmospheric Environment</i> 2002;36(27):4323-4335.	Geosciences
102	Oberdorster G	Translocation of inhaled ultrafine particles to the brain. <i>Inhalation Toxicology</i> 2004;16(6-7):437-445.	Pharmacology/ Toxicology
94	Dockery DW	Epidemiologic evidence of cardiovascular effects of particulate air pollution. <i>Environmental Health Perspectives</i> 2001;109(S4):483-486.	Environment/Ecology
89	Peters A	Exposure to traffic and the onset of myocardial infarction. <i>New England Journal of Medicine</i> 2004;351(17):1721-1730.	Clinical Medicine
75	Sarnat JA	Assessing the relationship between personal particulate and gaseous exposures of senior citizens living in Baltimore. <i>Journal of the Air & Waste Management Association</i> 2000;50(7):1184-1198.	Engineering
44	Xia T	Quinones and aromatic chemical compounds in particulate matter induce mitochondrial dysfunction: implications for ultrafine particle toxicity. <i>Environmental Health Perspectives</i> 2004;112(14):1347-1358.	Environment/Ecology
37	Kim S	Size distribution and diurnal and seasonal trends of ultrafine particles in source and receptor sites of the Los Angeles basin. <i>Journal of the Air & Waste Management Association</i> 2002;52(3):297-307.	Engineering

34	Landrigan PJ	Health and environmental consequences of the World Trade Center disaster. <i>Environmental Health Perspectives</i> 2004;112(6):731-739.	Environment/Ecology
29	Zhang KM	Evolution of particle number distribution near roadways: Part II: The “road-to-ambient” process. <i>Atmospheric Environment</i> 2004;38(38):6655-6665.	Geosciences
26	Cho A	Determination of four quinones in diesel exhaust particles, SRM 1649a and atmospheric PM _{2.5} . <i>Aerosol Science and Technology</i> 2004;38(S1):68-81.	Engineering
25	Park SK	Effects of Air Pollution on Heart Rate Variability: The VA Normative Aging Study. <i>Environmental Health Perspectives</i> 2005;113(3):304-309.	Environment/Ecology
23	Zhu Y	Seasonal trends of concentration and size distribution of ultrafine particles near major highways in Los Angeles. <i>Aerosol Science and Technology</i> 2004;38(S1):5-13.	Engineering
22	Zanobetti A	The effect of particulate air pollution on emergency admissions for myocardial infarction: a multicity case-crossover analysis. <i>Environmental Health Perspectives</i> 2005;113(8):978-982.	Environment/Ecology
19	Dockery DW	Association of air pollution with increased incidence of ventricular tachyarrhythmias recorded by implanted cardioverter defibrillators. <i>Environmental Health Perspectives</i> 2005;113(6):670-674.	Environment/Ecology
18	Delfino RJ	Potential role of ultrafine particles in associations between airborne particle mass and cardiovascular health. <i>Environmental Health Perspectives</i> 2005;113(8):934-946.	Environment/Ecology
17	Reisen F	Atmospheric reactions influence seasonal PAH and nitro-PAH concentrations in the Los Angeles Basin. <i>Environmental Science & Technology</i> 2005;39(1):64-73.	Environment/Ecology
13	McConnell R	Traffic, susceptibility, and childhood asthma. <i>Environmental Health Perspectives</i> 2006;114(5):766-772.	Environment/Ecology
7	Dubowsky SD	Diabetes, obesity, and hypertension may enhance associations between air pollution and markers of systematic inflammation. <i>Environmental Health Perspectives</i> 2006;114(7):992-998.	Environment/Ecology
7	Elder A	Translocation of inhaled ultrafine manganese oxide particles to the central nervous system. <i>Environmental Health Perspectives</i> 2006;114(8):1172-1178.	Environment/Ecology
7	Peng RD	Model choice in time series studies of air pollution and mortality. <i>Journal of the Royal Statistical Society: Series A (Statistics in Society)</i> 2006;169(2):179-203.	Economics/Business
5	Miller KA	Long-term exposure to air pollution and incidence of cardiovascular events in women. <i>New England Journal of Medicine</i> 2007;356(5):447-458.	Clinical Medicine
2	Baccarelli A	Effects of exposure to air pollution on blood coagulation. <i>Journal of Thrombosis and Haemostasis</i> 2007;5(2):252-260.	Clinical Medicine

Appendix 4. List of 2005 PM Center Publications in the Top 200 High-Impact Journals.⁵

Alexeef SE, Litonjua AA, Sparrow D, Vokonas PS, Schwartz J. (2007 Oct 15). Statin use reduced decline in lung function: VA Normative Aging Study. *American Journal of Respiratory and Critical Care Medicine*. 176(8):742-747.

Baccarelli A, Cassano PA, Litonjua A, Park SK, Suh H, Sparrow D, Vokonas P, Schwartz J. (2008 Apr 8). Cardiac autonomic dysfunction: Effects from particulate air pollution and protection by dietary methyl nutrients and metabolic polymorphisms. *Circulation*. 117(4):1802-1809.

Chan RC, Wang M, Li N, Yanagawa Y, Onoe K, Lee JJ, Nel AE. (2006 Aug). Pro-oxidative diesel exhaust particle chemicals inhibit LPS-induced dendritic cell responses involved in T-helper differentiation. *Journal of Allergy and Clinical Immunology*. 118(2):455-465.

Park SK, O'Neill MS, Vokonas PS, Sparrow D, Spiro A, Tucker KL, Suh H, Hu H, Schwartz J. (2008 May 8). Traffic-related particles are associated with elevated homocysteine: the VA Normative Aging Study. *American Journal of Respiratory and Critical Care Medicine*. (in press)

Peng RD, Chang HH, Bell ML, McDermott A, Zeger SL, Samet JM, Dominici F. (2008 May 14). Coarse particulate matter air pollution and hospital admissions for cardiovascular and respiratory diseases among Medicare patients. *Journal of the American Medical Association*. 299(18):2172-2179.

Xia T, Kovochich M, Brant J, Hotze M, Sempf J, Oberley T, Sioutas C, Yeh JI, Wiesner MR, Nel AE. (2006 Aug 9). Comparison of the abilities of ambient and manufactured nanoparticles to induce cellular toxicity according to an oxidative stress paradigm. *Nano Letters*. 6(8):1794-1807.

⁵ As determined by JCR Impact Factor. See footnote 4 for more information.