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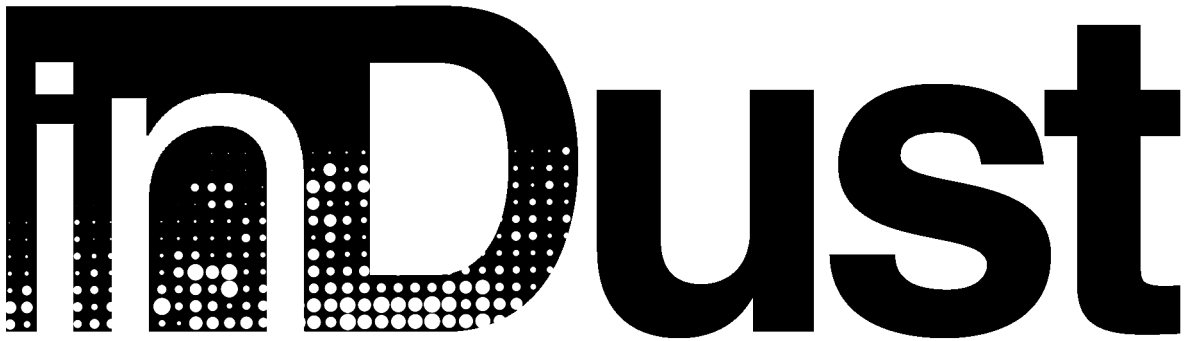
International Network to Encourage the Use of Monitoring and Forecasting Dust Products



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inDust

Goals for the meeting

- To discuss the availability of **measurements and products to identify dust** events and sources for natural and local contributions to particulate matter
- To discuss the main **methodological characteristics to help developing a standardized study protocol** for the short-term health effects
- To develop a document **providing guidelines** for future studies

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Framework

- To estimate the short-term health effects of desert dust in and near to hot spots, using an epidemiological study design with same methodological characteristics
- It should be,
  - Affordable every where
  - With data availability
  - Quick and ‘easy’ to carry out
  - Cheap, very cheap …

Epidemiology

- Study design
  - Time-series (or case-crossover)
- Health outcome
  - Health counts (all natural cause mortality)
- Confounders
  - Calendar time (time trend, seasonality, weekdays)
  - Temperature

Exposure

- Dust exposure
  - Dust event (yes/no)
  - PM10, PM2.5 and PM10-2.5
    - Antro. PMx on non-dust days
    - Antro PMx on dust days
    - Dust PMx on dust days

Exposure

- Measurement methods & products discussed
  - Reference method
  - Diapason
  - SDS-WAS & other products
  - LIDAR

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Data availability

Data	Europe	Middle East	Eastern Asia	Others
Health outcomes	Medpart MCC	Israel? Iran?	MCC	MCC
Dust exposures openaq.org	Medpart SDS-WAS	SDS-WAS		

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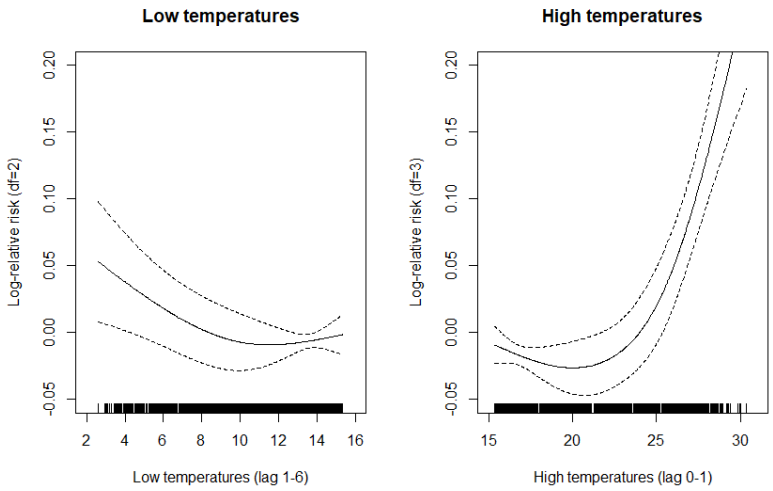
Statistical analysis

- Adjustment for temperature
  - Medpart method *vs.* dlnm
- Lagged effects
  - individual *vs.* cumulative
  - averaged *vs.* dlnm lags
- Interaction term between dust events and PM
- Dealing with dust exposures which might reach extreme values, in hot spot areas

Temperature adjustment

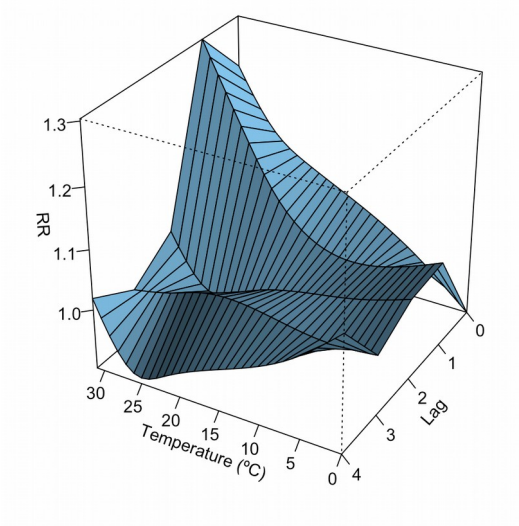
- Medpart

(AIC = 14739.8)



- DLNM

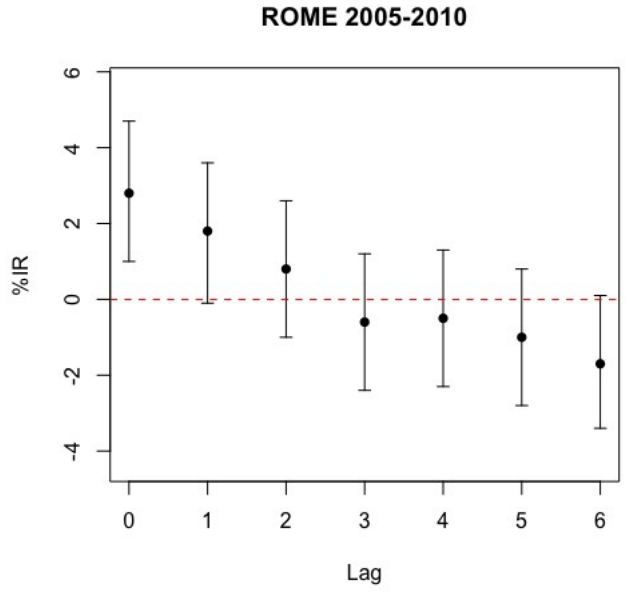
(AIC = 13884.6)

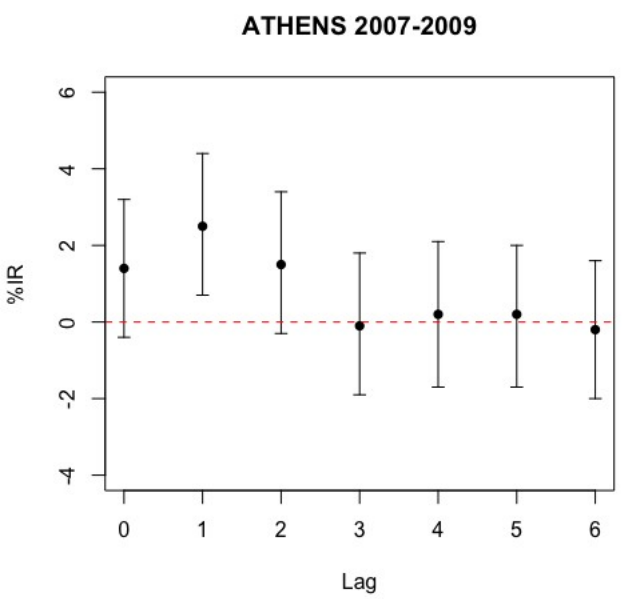


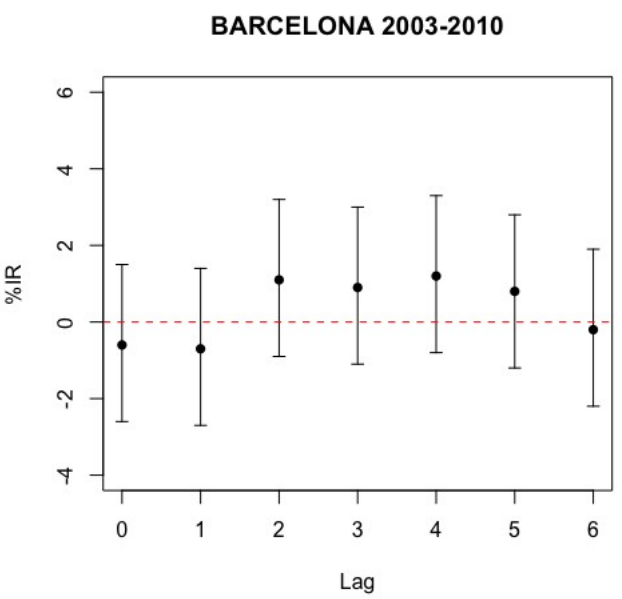
Temperature adjustment

(Rome 2005-2010)		Medpart	
Model	**Exposures**	**%IR**	**(95% CI)**
1	Dust *vs.* non-dust	2.8	(1.0, 4.7)
2	Dust *vs.* non-dust	2.3	(0.5, 4.2)
	PM_{10}	0.9	(0.4, 1.4)
3	PM_{10}		
	on non-dust days	0.8	(0.2, 1.3)
	on dust days	1.5	(0.3, 2.7)
4	PM_{10} - Local	1.0	(0.5, 1.5)
	PM_{10} - Natural	0.9	(-0.2, 2.0)
5	**PM_{10} - Local**		
	on non-dust days	0.8	(0.3, 1.4)
	on dust days	2.4	(0.9, 4.0)
	PM_{10} - Natural	0.4	(-0.9, 1.7)

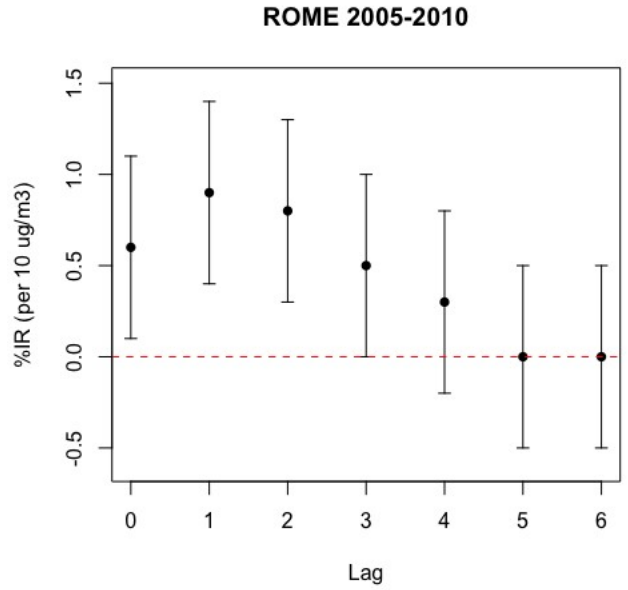
Lag structure for dust events

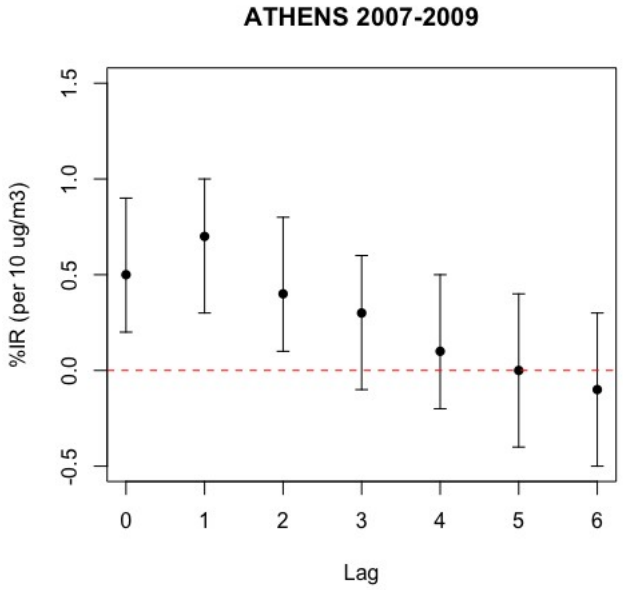


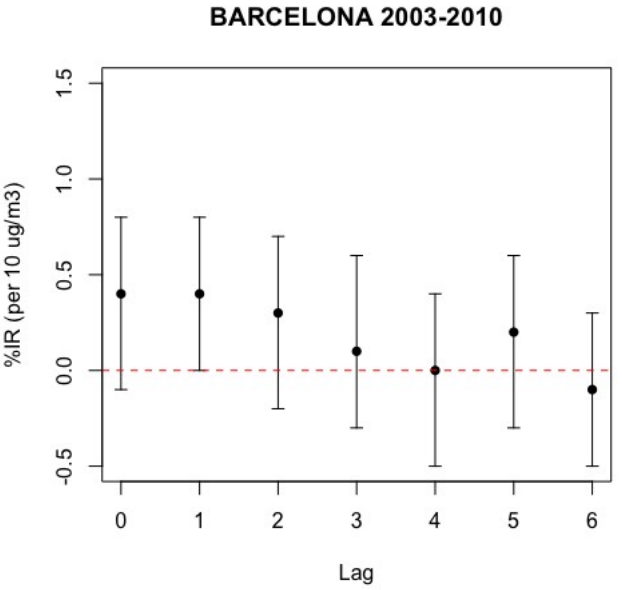




Lag structure for PM_{10}

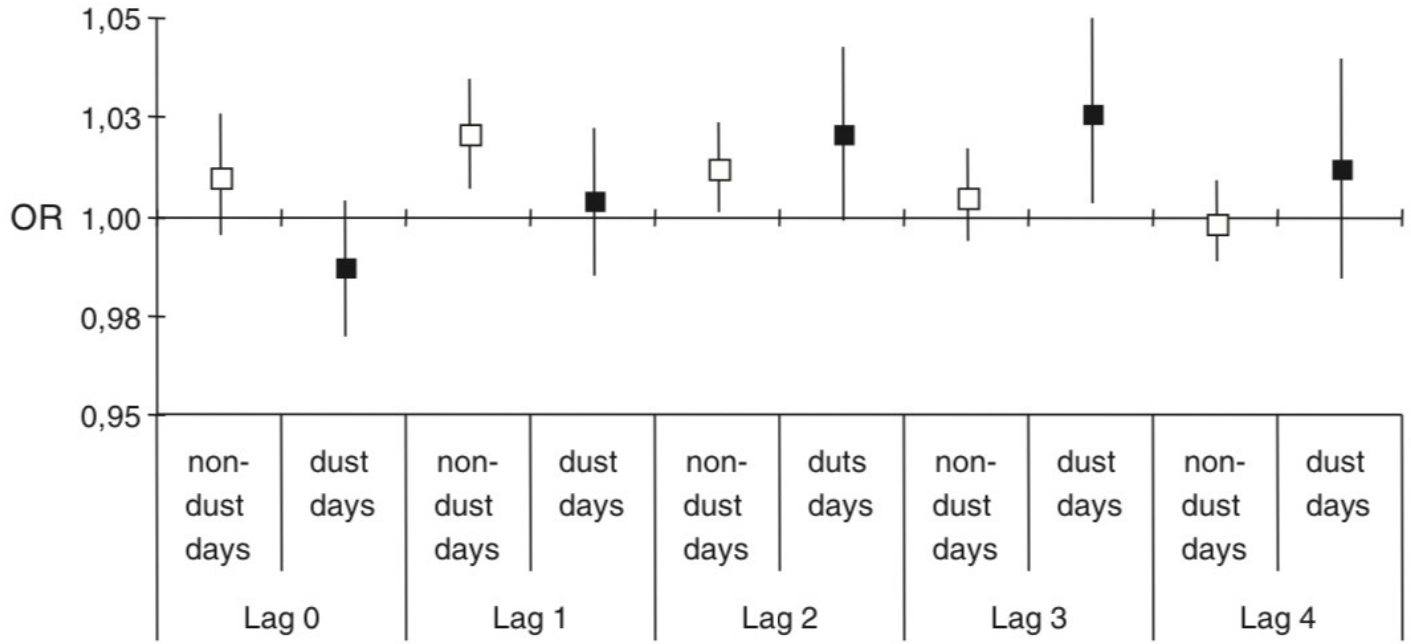






Lagged structures

- Madrid, Spain, 2003-2005 *(Tobías et al. Stoten 2011)*



Extreme exposures

- Mortality risk attributable to temperature *(Gasparrini et al. Lancet 2015)*

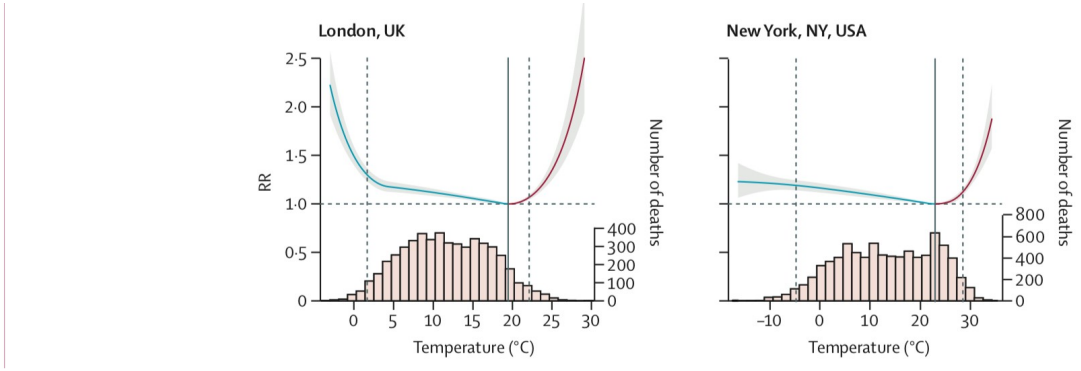


Figure 1: **Overall cumulative exposure–response associations in 13 cities**
Exposure–response associations as best linear unbiased prediction (with 95% empirical CI, shaded grey) in representative cities of the 13 countries, with related temperature distributions. Solid grey lines are minimum mortality temperatures and dashed grey lines are the 2·5th and 97·5th percentiles. RR=relative risk.

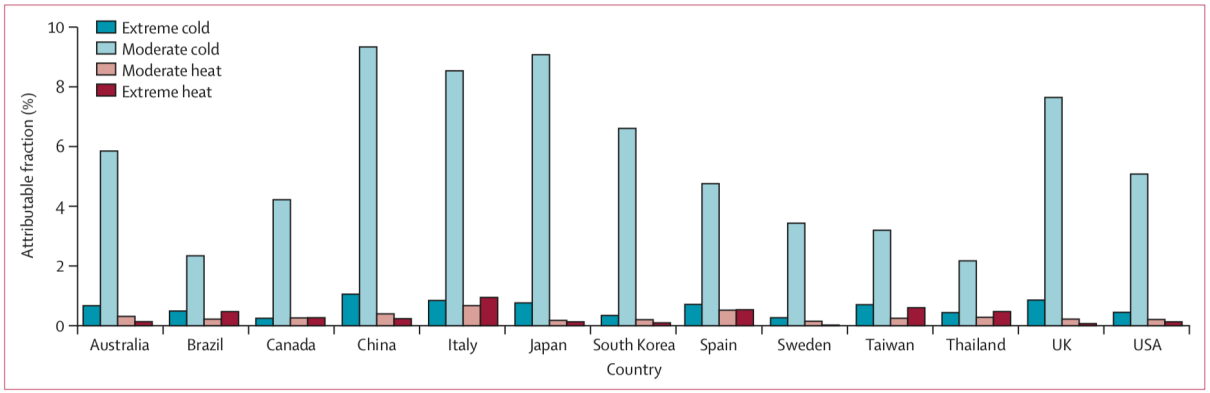


Figure 2: **Fraction of all-cause mortality attributable to moderate and extreme hot and cold temperature by country**
Extreme and moderate high and low temperatures were defined with the minimum mortality temperature and the 2·5th and 97·5th percentiles of temperature. distribution as cutoffs.

Extreme PM exposure

- Ahvaz, Iran, 2015-2017 *(in progress)*

			PM10				
	n	(%)	Mean	Min.	Max.	%IR	(95% CI)
Non-MED	574	66%	99.9	18.0	149.9	1.1	(0.7 , 1.5)
MED-							
Low	58	7%	194.5	150.6	874.6	1.4	(0.6 , 2.1)
Medium	158	18%	238.4	150.0	1191.5	0.9	(0.6 , 1.2)
High	78	9%	324.4	152.8	2066.4	0.5	(0.1 , 0.8)

Tasks

- To develop a document describing
  - Main methods to measure/model dust events and sources
  - Methodological characteristics for time-series studies
- Follow up meeting/activities
  - ISEE 2019 conference in Utrecht
  - inDust meeting 2019/2020

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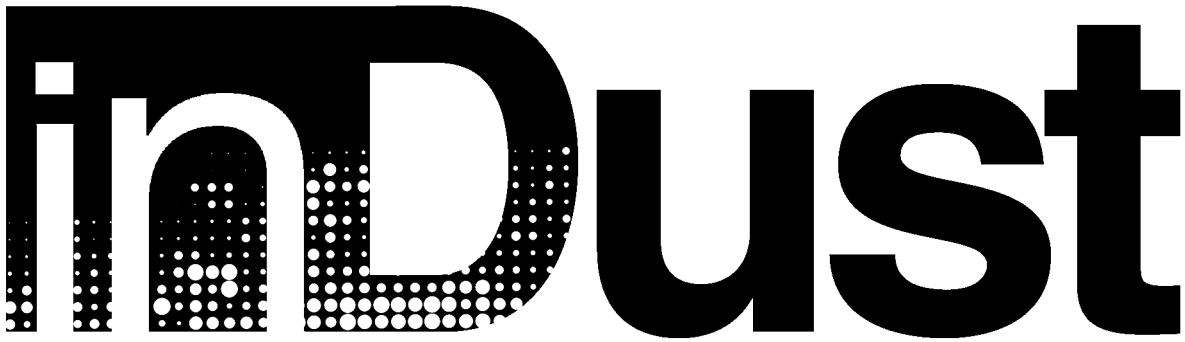

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Health effects of Sand and Dust Storms

- A recent systematic review commissioned by WHO , with standardized protocol, shows the need to **develop an standardize study protocol** for epidemiological studies for the short-term health effects of sand and dust storms, with same methodological characteristics, in and near to hot spots

1. Which dust products should/can we use for epidemiological studies

- State of knowledge to identify dust event exposures and measure/model local and natural sources
- Agreement level between methods based on monitored data and model predictions.
- Recommendations to identify dust event exposures in hot spot geographical areas without monitored data available

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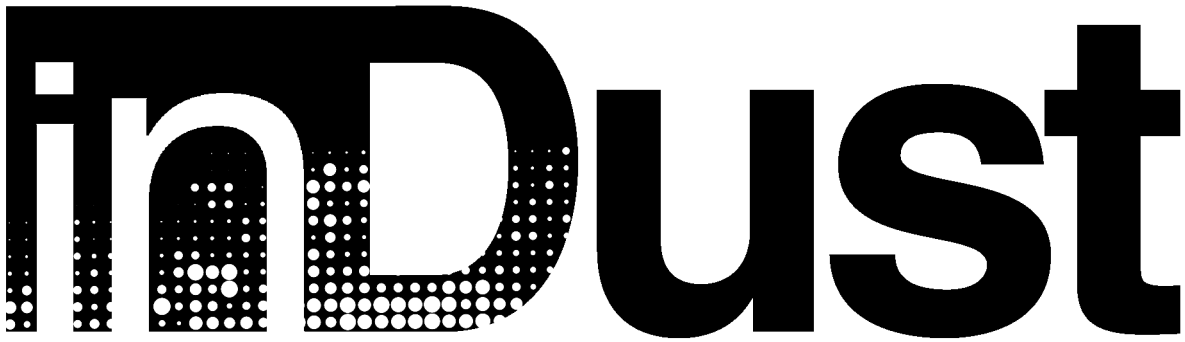

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