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Title: Neural networks analysis of spontaneous pneumothorax development

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Body: Spontaneous pneumothoraces (SP) tend to cluster. Correlations between SP and atmospheric variations were reported by previous studies. In our work SP correlation with meteo variables and air pollutants in Cuneo County was analyzed. 2004-2010, 451 SP patients were prospectively evaluated. For each day of analyzed period, meteo parameters and pollutants were recorded. Statistics on SP evaluated distribution characteristics, spectral autocorrelation and spectral analysis; multivariate regression techniques were performed using artificial neural networks. Analysis of seasonal distributions showed no significant correlation. Spectral analysis showed that SP events were not random. Correlations between meteo-environmental variables were analyzed through linear tests.

Linear tests on meteo variables and pollutants

Variables	t	Kolmogorov-Smirnov	Mann-Whitney
Temperature (T)	0.003	0.073	0.037
Humidity (H)	0.046	0.015	0.089
Pressure (P)	0.090	0.034	0.083
Wind (W)	0.037	0.415	0.070
NO_2	0.022	0.165	0.050
O_3	0.027	0.092	0.044

Neural networks showed some variables may predict SP insurgence.

Multivariate regression

$O_3+NO_2+W+P+T$	r_s	FAR	FP	FN	DP	EF	HSS

Neural network	0.15	0.75	0.52	0.30	0.70	0.34	0.11
Regression	0.04	0.78	0.32	0.64	0.36	0.25	0.03
NO_2+W+P+T							
Neural network	0.13	0.74	0.39	0.45	0.55	0.34	0.12
Regression	0.01	0.79	0.27	0.79	0.28	0.21	0.01
O_3+NO_2+W+P							
Neural network	0.18	0.73	0.48	0.30	0.70	0.36	0.14
Regression	0.01	0.80	0.62	0.38	0.63	0.24	0.01

r_s: correlation. Best performance: ↑Heidke's Skill Statistics (HSS); ↓false alarm ratio (FAR)+false negative (FN); ↑detection probability (DP)+efficiency (EF)

SP occurrence significantly increases in warm windy days with high atmospheric pressure and high NO_2 concentration. These data don't affect SP treatment; nevertheless, they add information on SP tendency to cluster.