Molecular Descriptors Family on Structure-Activity and Structure-Property Relationships: Results

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Purpose

- **To present the results obtained by utilization of an original approach called Molecular Descriptors Family (MDF) on Structure-Property (SPR) and Structure-Activity Relationships (SAR) applied on different classes of chemical compounds and its usefulness as precursors of models elaboration of new chemical compounds with better properties and/or activities.**

Methodology

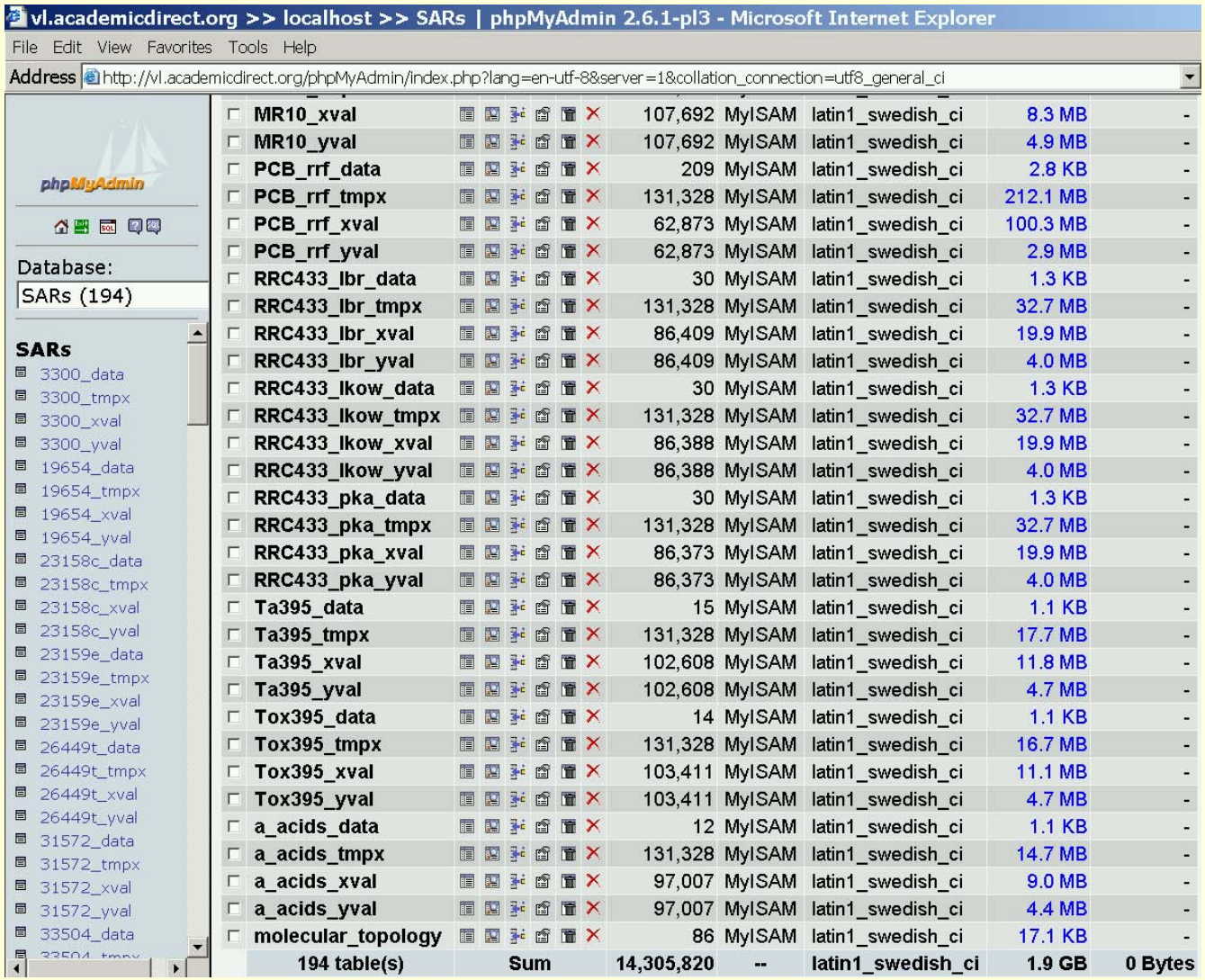
Molecular Descriptors Family

- **Preparing chemical compounds for molecular modeling**
- **Generating the molecular descriptors family**
- **Finding the MDF SPR/SAR models**
- **Validating the MDF SPR/SAR models**
- **Comparing the MDF SPR/SAR models with previous reported model(s)**

Materials

Set name	Observed/Measured Property/Activity
IChr	retention chromatography index
PCB_rrf	relative response factor
23159	octanol/water partition coefficients
23159e	octanol/water partition coefficients
PCB_lkow	octanol/water partition coefficient
36638	water activated carbon adsorption
MR10	molar refraction
Ta395	cytotoxycity
52730	toxicity
Tox395	mutagenicity
41521	insecticidal activity
Triazines	herbicidal activity
52344	antioxidant efficacy
26449	antituberculotic activity
23151	antimalarial activity
22583	anti-HIV-1 potencies

Results: database



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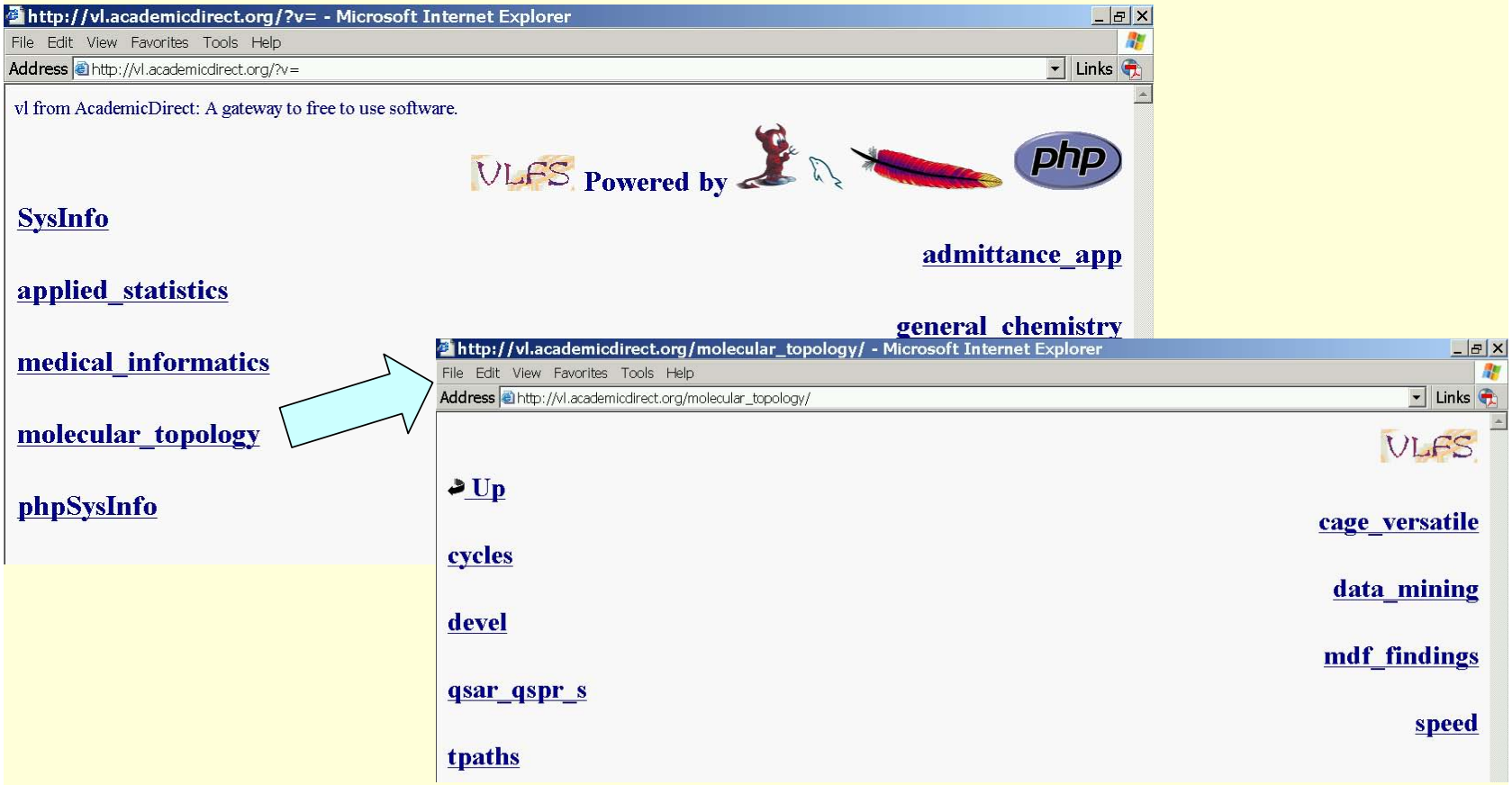
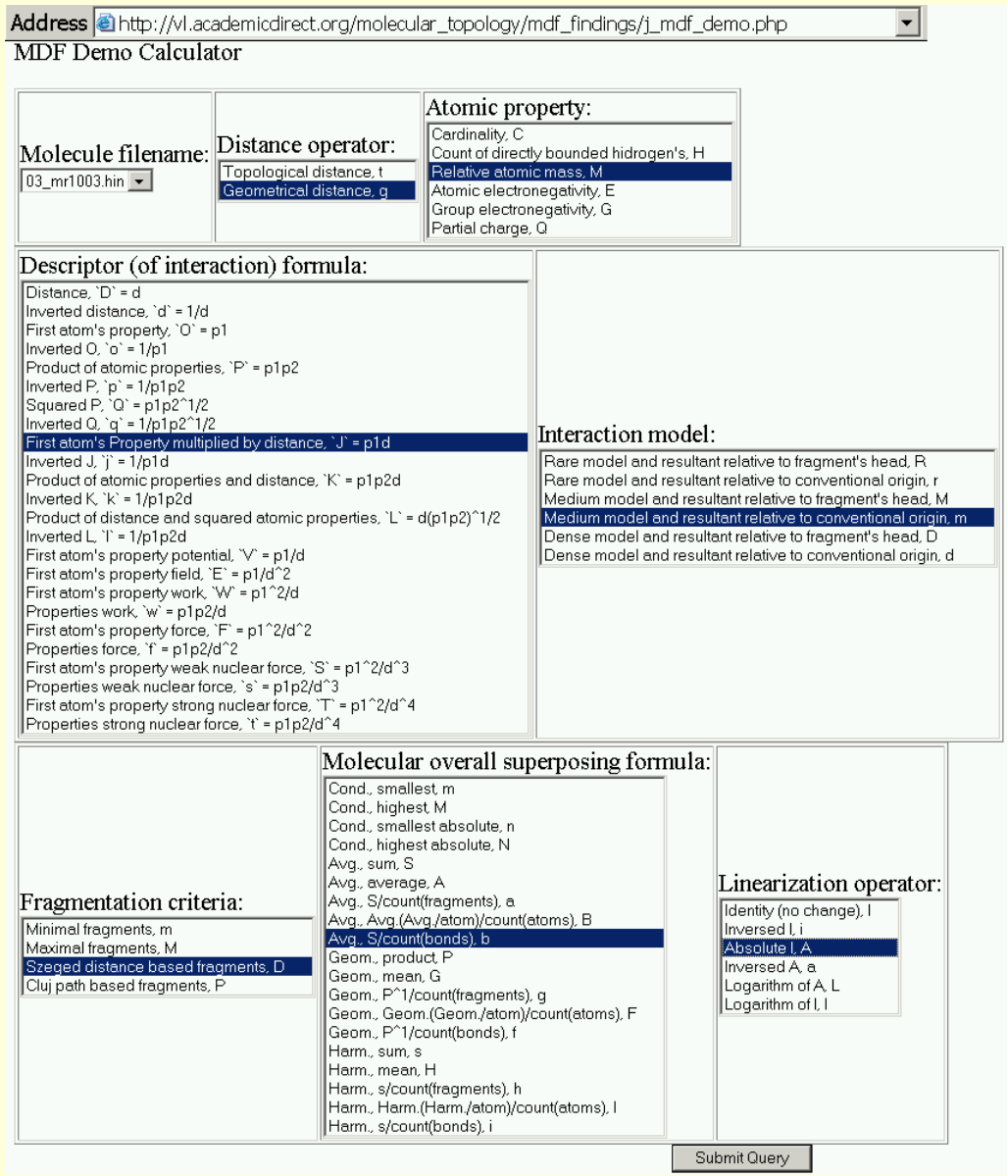
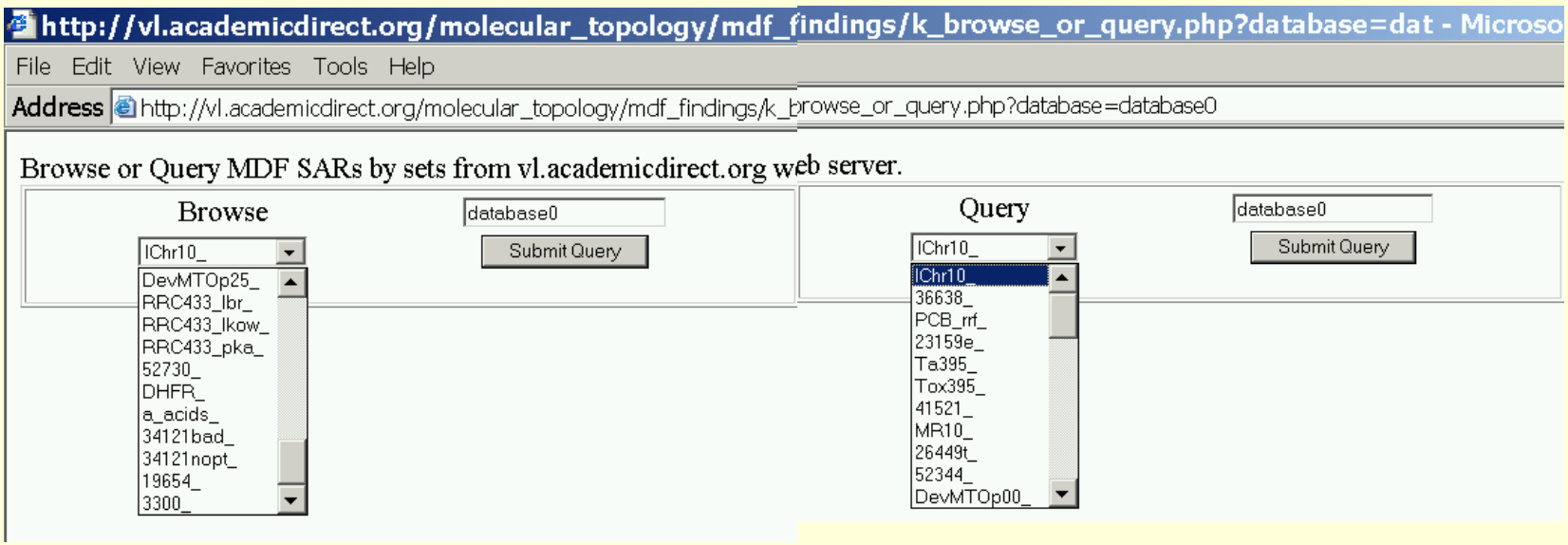
Results: web interface



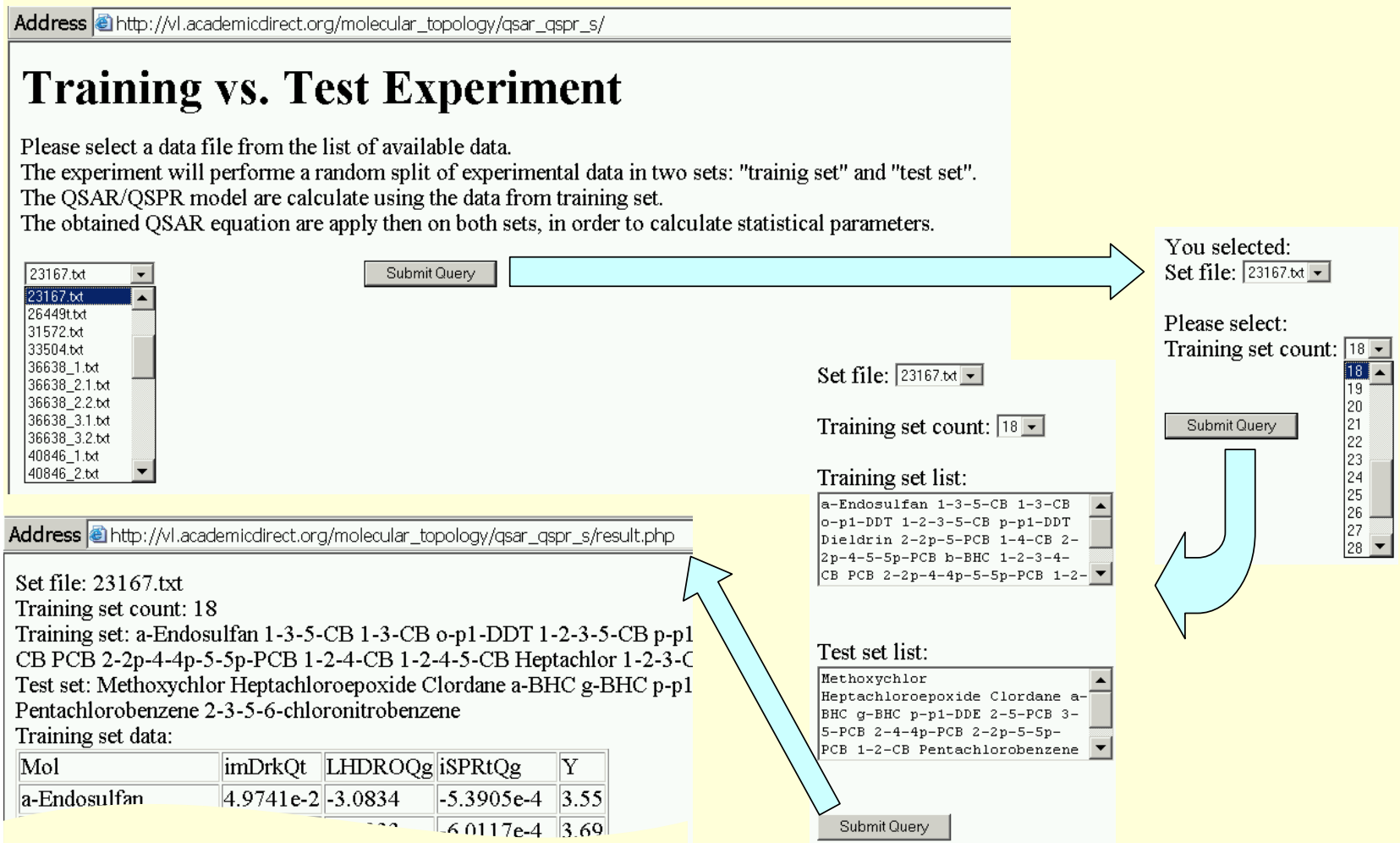
Results: MDF model



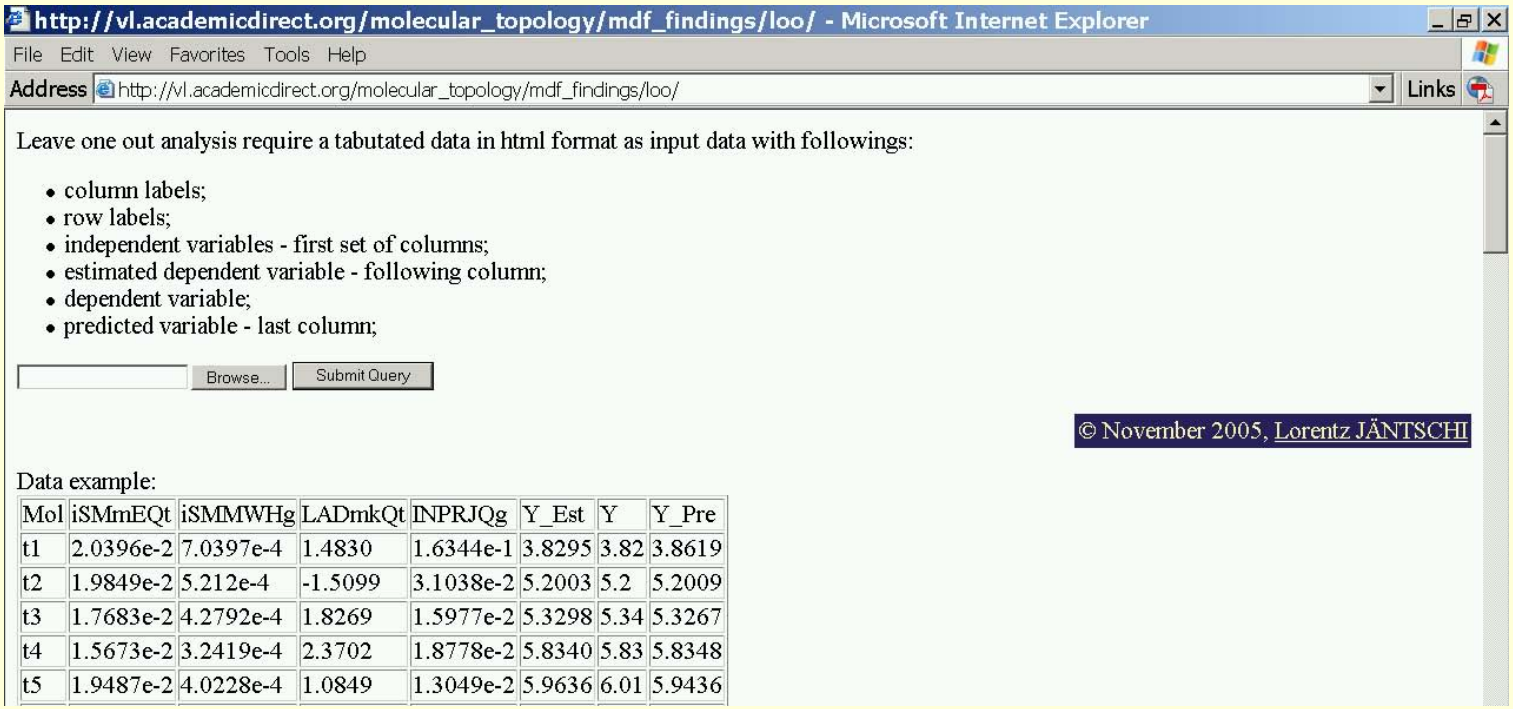
Results: investigated datasets



Results: training vs. test application



Results: leave one out application



Mol	iSMmEQt	iSMMWHg	LADmkQt	INPRJQg	Y_Est	Y	Y_Pre
t1	2.0396e-2	7.0397e-4	1.4830	1.6344e-1	3.8295	3.82	3.8619
t2	1.9849e-2	5.212e-4	-1.5099	3.1038e-2	5.2003	5.2	5.2009
t3	1.7683e-2	4.2792e-4	1.8269	1.5977e-2	5.3298	5.34	5.3267
t4	1.5673e-2	3.2419e-4	2.3702	1.8778e-2	5.8340	5.83	5.8348
t5	1.9487e-2	4.0228e-4	1.0849	1.3049e-2	5.9636	6.01	5.9436

Results: comparisons

Set name	Previous reported SAR			MDF SAR			
	r^2	n	v	r^2	$r^2_{cv(loo)}$	n	v
IChr10	0.900	10	2	0.999	0.999	10	2
PCB_rrf	-	-	-	0.628	0.619	209	1
				0.693	0.682	209	2
				0.737	0.717	209	4
PCB_lkow	-	-	-	0.873	0.87	206	1
				0.89	0.885	206	2
				0.917	0.909	206	4
36638	0.967	16		0.994	0.991	16	3
23159	0.388	18	1	0.755	0.684	18	1
	0.839	18	3	0.982	0.974	18	2
23159e	-	-	-	0.899	0.758	8	1
				0.968	0.898	8	2
Ta395	0.870	13	2	0.977	0.961	15	2
Tox395	0.800	13	2	0.957	0.934	14	2

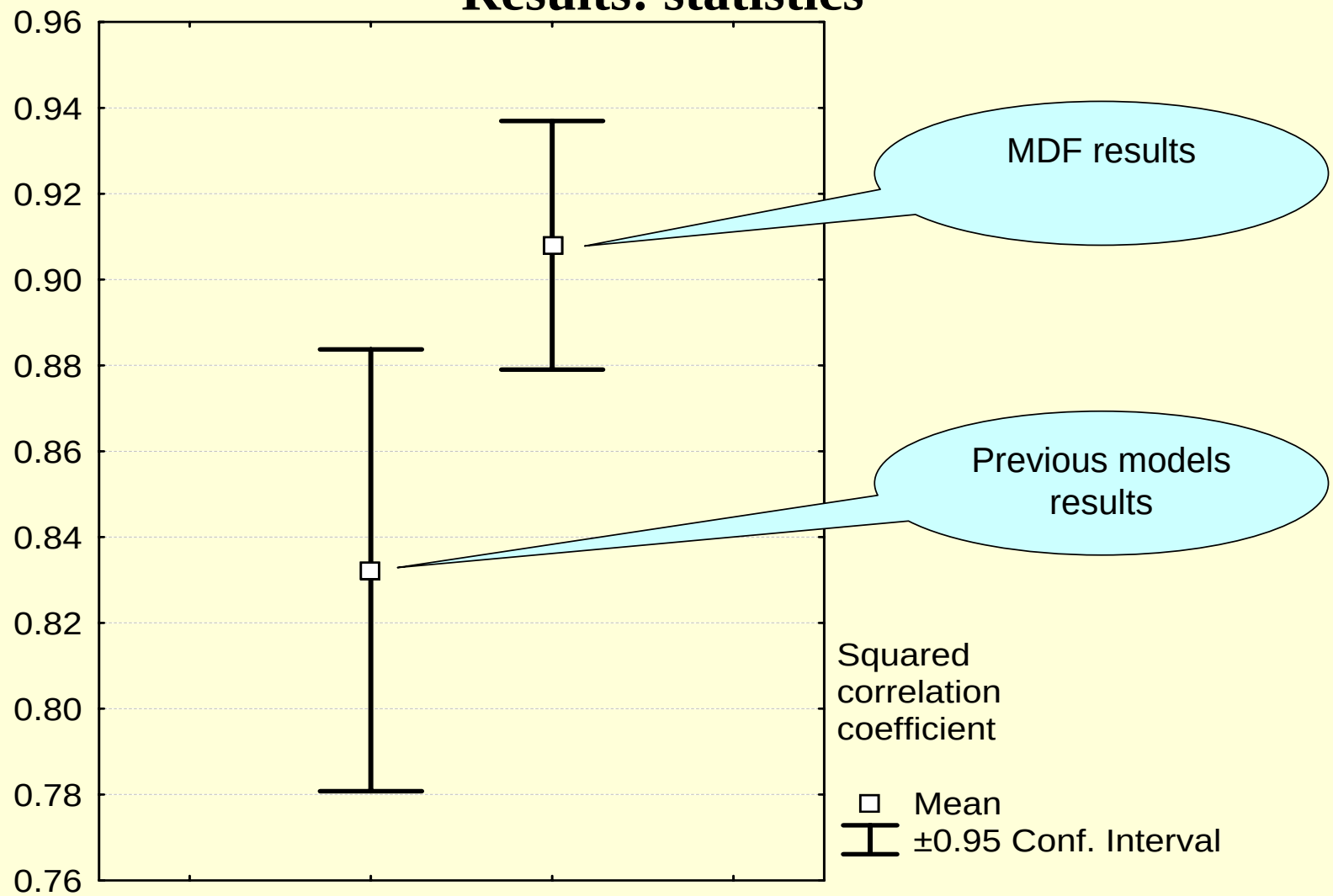
Results: comparisons

Set name	Previous reported SAR			MDF SAR			
	r^2	n	v	r^2	$r^2_{cv(loo)}$	n	v
	0.913	8	3				
41521	0.985	8	5	0.999	0.998	8	2
	0.991		1	0.961	0.954	10	1
	0.998		2	0.99	0.988	10	2
26449	0.993	10	4	0.998	0.997	10	4
MR10	0.976	10	2	0.999	0.999	10	2
	0.741	16	4				
23151	0.985	13	4	0.997	0.995	16	3
	0.780	8	1	0.904	0.832	8	1
	0.710	8	1	0.999	0.999	8	2
	0.810	8	2	0.999	0.999	8	2
52344	0.970	8	4	0.999	0.999	8	2

Results: comparisons

Set name	Previous reported SAR			MDF SAR			
	r^2	n	v	r^2	$r^2_{cv(loo)}$	n	v
52730	-	-	-	0.966	0.947	10	1
				0.998	0.996	10	2
Triazines	0.970	30	3	0.951	0.946	30	1
				0.975	0.971	30	2
				0.983	0.976	30	3
				0.989	0.985	30	4
22583	0.888	37	5	0.783	0.766	57	2
	0.885	20	5	0.835	0.809	57	3
	0.883	57	5	0.9	0.884	57	4
				0.918	0.9	57	5

Results: statistics



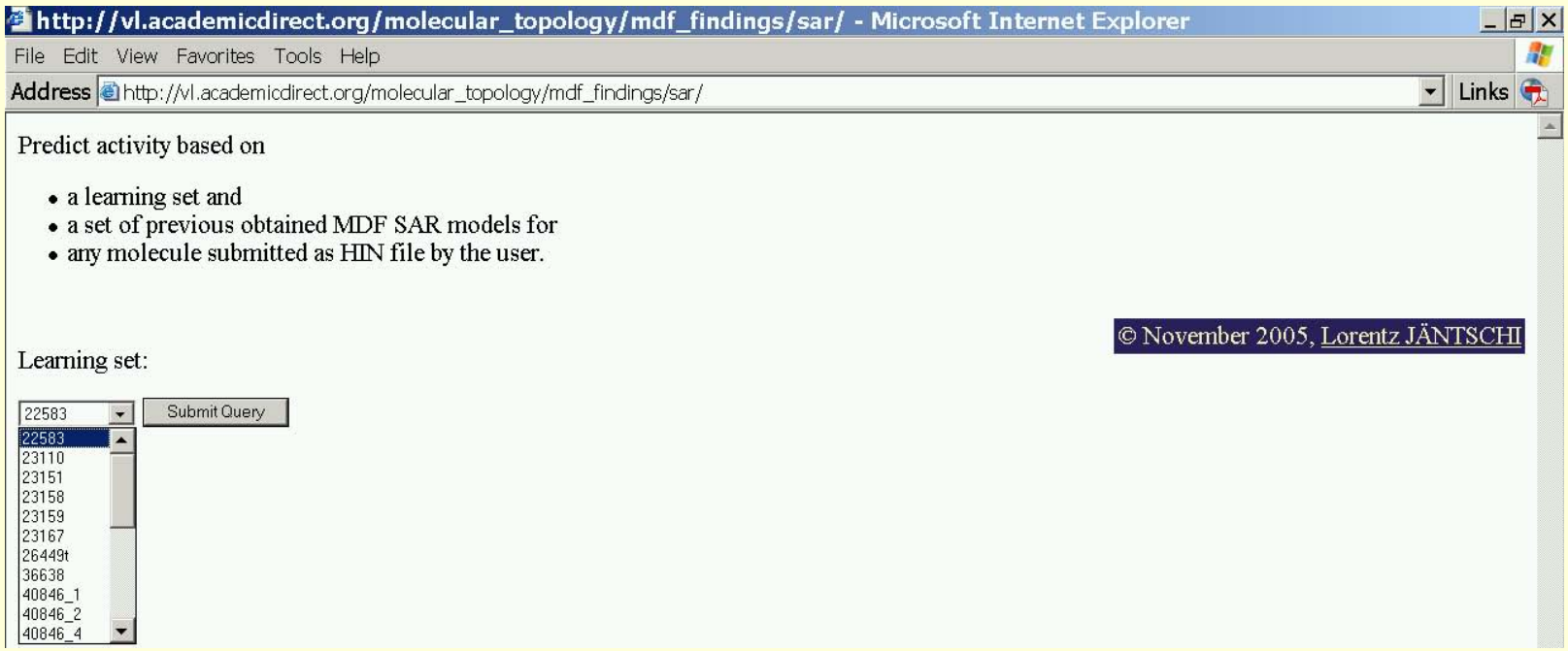
Conclusions: SPR

- **Molecular Descriptors Family on Structure-Property Relationships obtained very good performances in estimation and prediction of compound's properties as are for example retention chromatographic index, molar refraction and water activated carbon organics adsorption.**

Conclusions: SAR

- **Good performances are also obtained by Molecular Descriptors Family on Structure-Activity Relationships in estimation and prediction of compound's activities as are for example toxicity of alkyl metal compounds, insecticidal activity of neonicotinoid compounds, antituberculotic activity of polyhydroxyxanthones, antioxidant efficacy of 3-indolyl derivates, or antimalarial activity of some 2,4-diamino-6-quinazoline sulfonamide derivates.**

Conclusions: new compounds virtual building



Conclusions

- **The MDF SPR/SAR methodology opens a new pathway in:**
  - **understanding the relationships between compounds structure and property/activity,**
  - **characterization,**
  - **investigation,**
  - **development of new compounds,**

  more competitive as costs and property/activity.

Acknowledgments

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Thank you for your attention!