
1 *Shifting application dates on cereal reduces pesticide transfer via*
2 *subsurface drainage based on water flow forecasts during autumn*
3 *applications*

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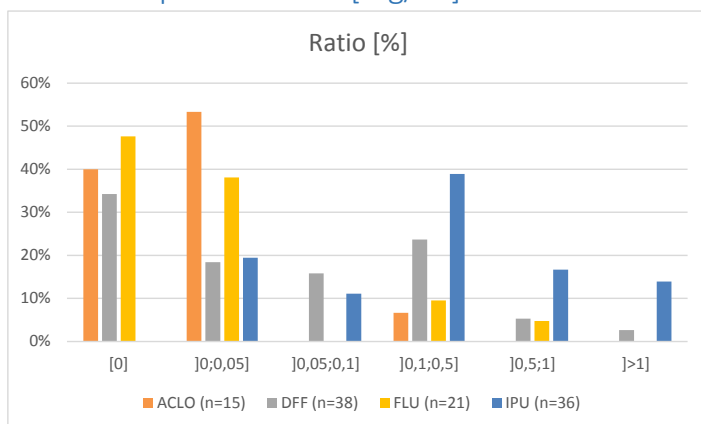
11
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13
14 *Supplemental Material*

15 IPU = isoproturon, ACLO = aclonifen, DFF = diflufenican, FLU = flufenacet.

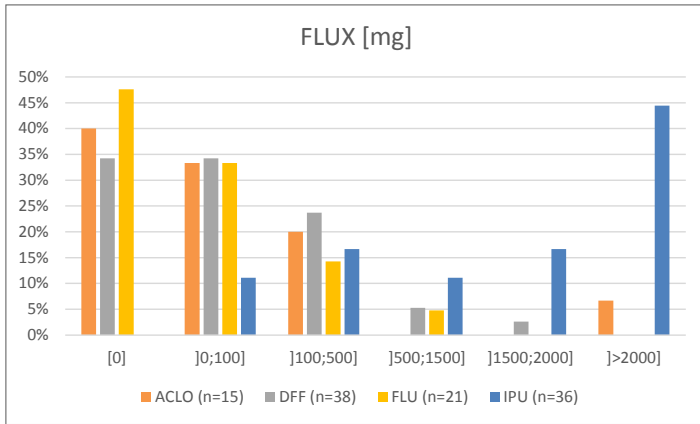
16 All variables are described in the main text.

17
18 1.1 *Frequency histograms for annual exportation ratio R_{exp} , annual exported*
19 *pesticide flux [mg/ha] and Cmax variables*



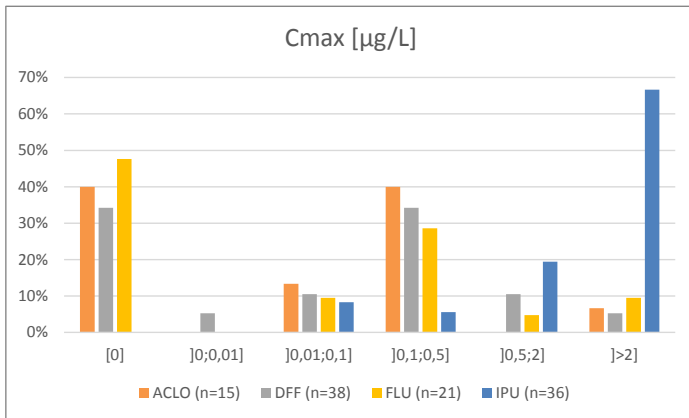
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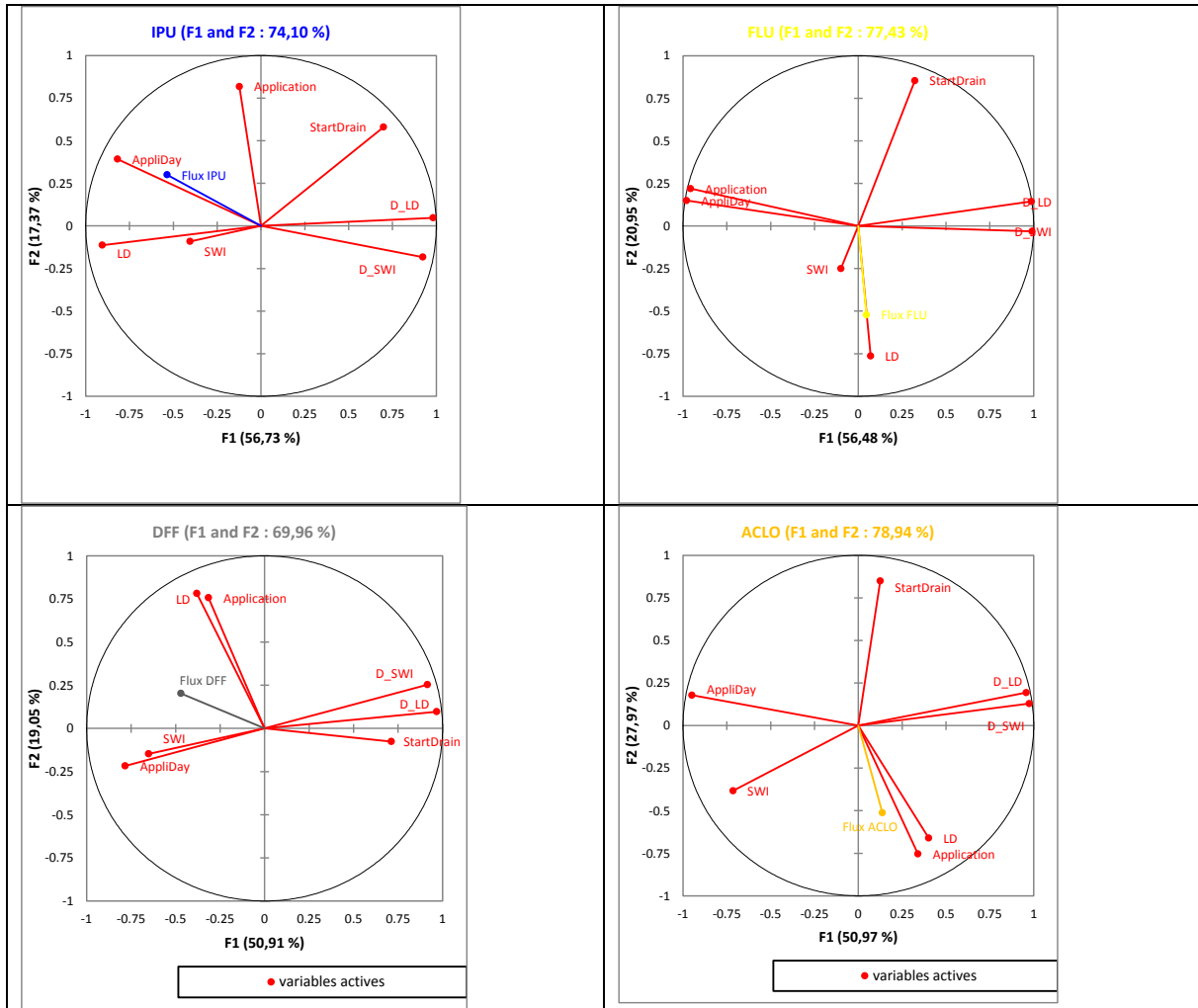
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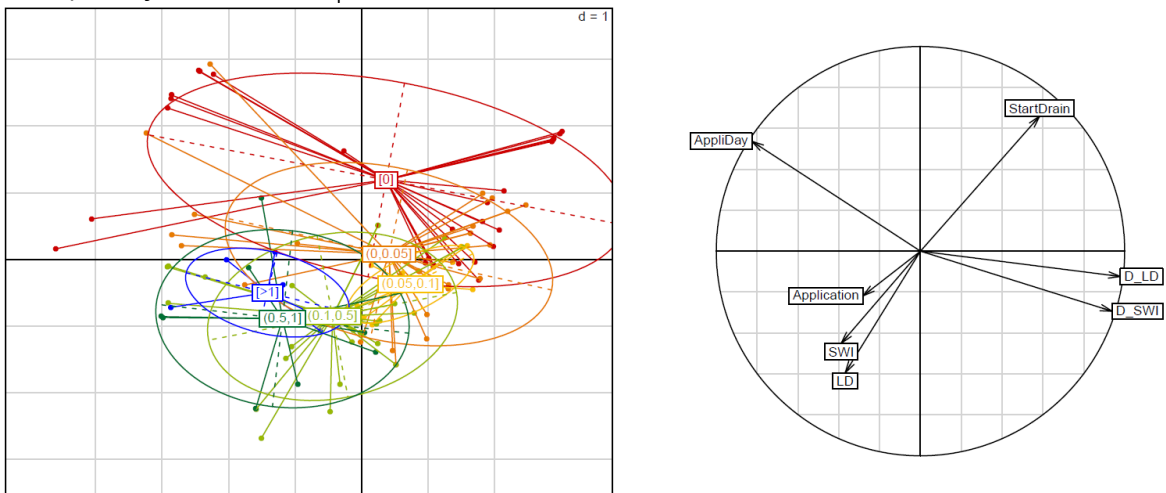
26 1.2 additional PCA figures

27 1) PCA for individual pesticides

28 PCA results for all pesticides (top) and individual pesticides

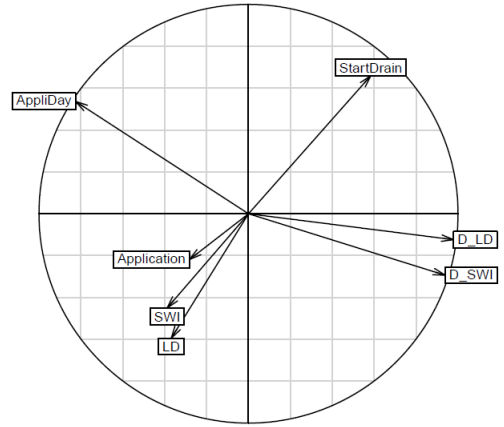
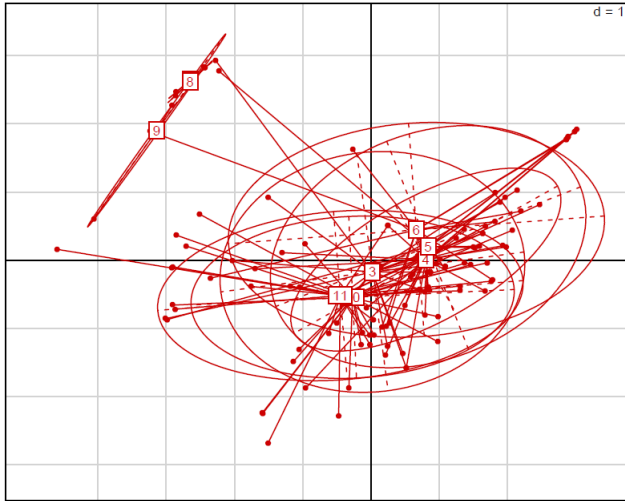


29 2) Projection of « R_{exp} » variable on the two axes of PCA



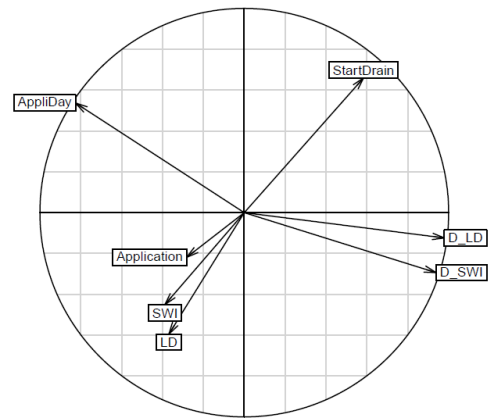
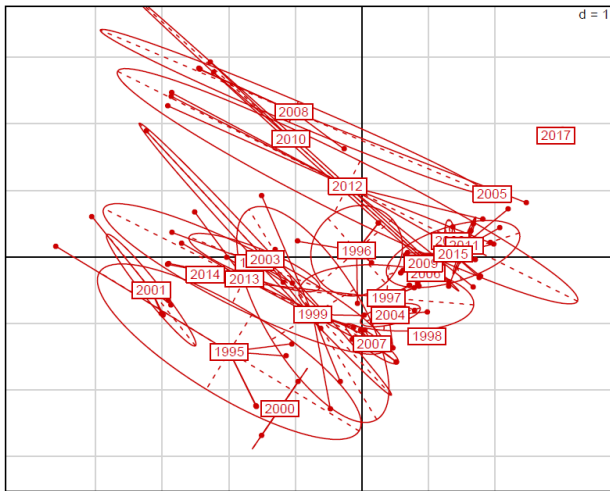
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31 3) Projection for « plot » variable



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33 4) Projection for « hydrological seasons » variable



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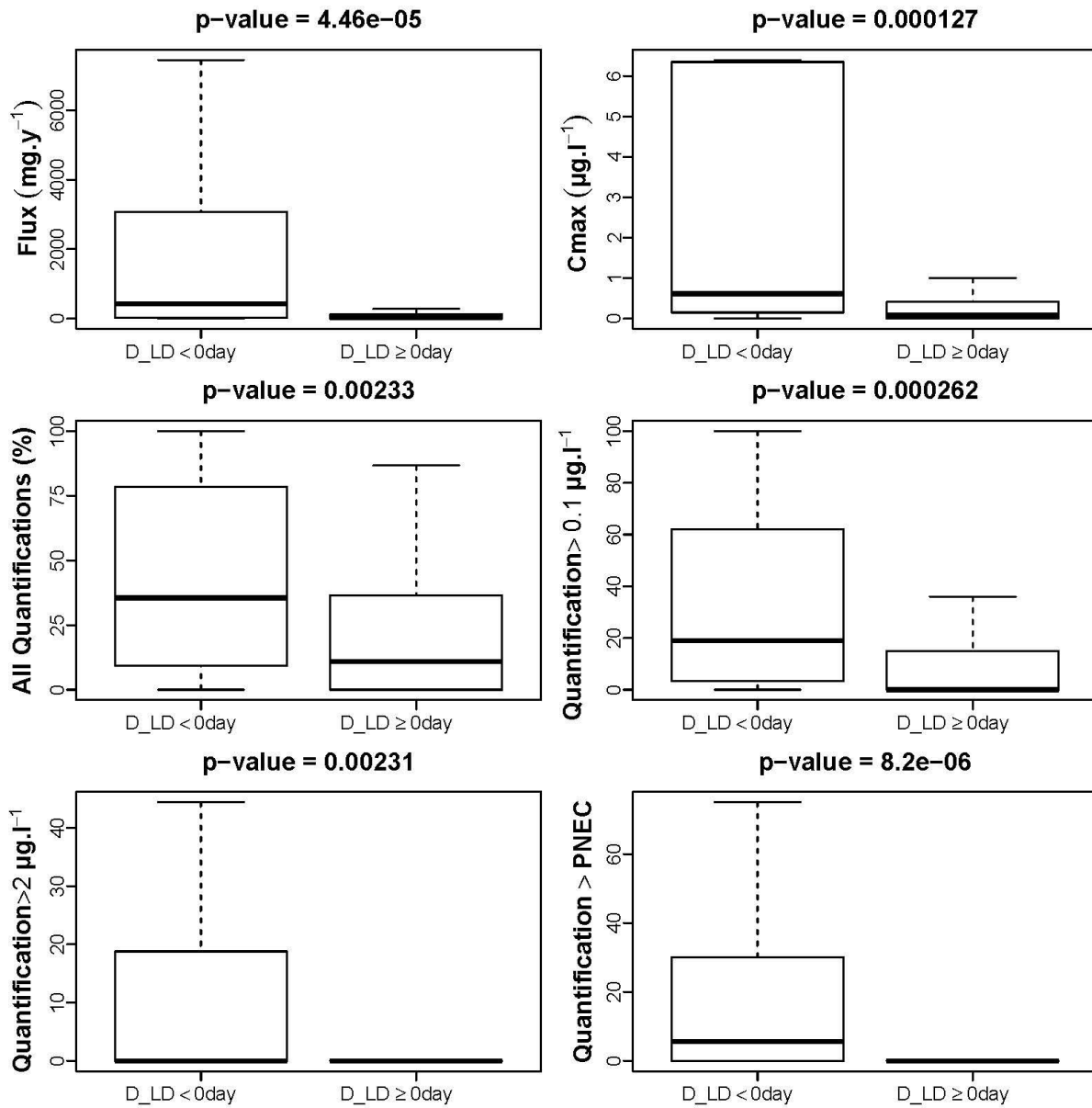
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1.3 Boxplot on D_LD threshold

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Figure. Box and whisker plots for Cmax, quantification (percentage of analyzed samples > LOD),

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percentage of quantified concentrations > 0.1 µg/L, > 2 µg/L, > PNEC, clustering for a D_LD before

43

(>0) or later (<0) application date.

1.4 Data matrix used for PCA

Year	Molecule	Plot	Koc [cm3/L]	DT50 [d]	LD [mm]	SWI [%]	Dose [-]	AppliDay [d]	StartDrain [d]	D_LD [d]	D_SWI [d]	Rank_ratio [%]	Rank_Flux [mg]	Rank_Cmax [µg/L]	Rank_CMP [µg/L]	All_quant [%]	Quant0.1 [%]	Quant2 [%]	QuantIPNEC [%]
1994	ACLO	10	7126	80	352	0.94	1.00	198	98	-100	-158	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.01]	13.8	6.9	0	0
1995	ACLO	11	7126	80	183	0.91	1.00	204	22	-182	-225	[0]	[0]	[0]	[0]	0	0	0	0
1996	ACLO	10	7126	80	237	0.97	1.00	157	119	-38	-70	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.1]	26.3	10.5	0	0
1997	ACLO	11	7126	80	348	0.95	1.00	159	91	-68	-88	]0;0.05]	]0;100]	]0.01;0.1]	]0;0.01]	9.5	0	0	0
1998	ACLO	10	7126	80	554	0.42	1.00	64	100	36	5	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.1]	11.1	11.1	0	0
2000	ACLO	11	7126	80	432	1	1.00	76	20	-56	-50	]0.1;0.5]	]>2000]	]>2]	]0.5;2]	37.5	16.7	8.3	8.3
2001	ACLO	9	7126	80	411	0.85	0.17	231	45	-186	-192	[0]	[0]	[0]	[0]	0	0	0	0
2002	ACLO	10	7126	80	155	0.89	0.50	67	119	52	-20	]0;0.05]	]0;100]	]0.01;0.1]	]0;0.1]	36.4	0	0	0
2004	ACLO	11	7126	80	242	0.57	0.88	57	76	19	4	]0;0.05]	]100;500]	]0.1;0.5]	]0;0.1]	23.8	9.5	0	0
2008	ACLO	7	7126	80	150	0.82	0.13	259	127	-132	-162	[0]	[0]	[0]	[0]	0	0	0	0
2008	ACLO	8	7126	80	150	0.82	0.13	259	127	-132	-162	[0]	[0]	[0]	[0]	0	0	0	0
2008	ACLO	9	7126	80	150	0.82	0.13	259	127	-132	-164	[0]	[0]	[0]	[0]	0	0	0	0
2008	ACLO	11	7126	80	205	0.28	0.50	68	127	59	28	]0;0.05]	]100;500]	]0.1;0.5]	]0.1;0.5]	25	15	0	0
2010	ACLO	10	7126	80	280	0.59	0.38	66	88	22	7	]0;0.05]	]100;500]	]0.1;0.5]	]0;0.1]	40.9	9.1	0	0
2012	ACLO	11	7126	80	361	0.35	0.50	74	105	31	25	[0]	[0]	[0]	[0]	0	0	0	0
1994	DFF	4	3416	64	452	1	1.00	159	103	-56	-104	]>1]	]1500;2000]	]>2]	]0.1;0.5]	86.1	19.4	2.8	13.9
1994	DFF	11	3416	64	556	1	1.00	159	103	-56	-59	]0.1;0.5]	]100;500]	]0.5;2]	]0;0.1]	65.5	17.2	0	10.3
1995	DFF	3	3416	64	361	0.95	1.00	85	22	-63	-77	]0.1;0.5]	]500;1500]	]0.5;2]	]0.1;0.5]	52.2	43.5	0	34.8
1995	DFF	10	3416	64	299	0.95	1.00	85	22	-63	-76	]0.1;0.5]	]100;500]	]0.5;2]	]0.1;0.5]	81.8	40.9	0	27.3
1996	DFF	4	3416	64	604	0.99	1.00	125	119	-6	-34	]0.05;0.1]	]0;100]	]0.5;2]	]0;0.1]	15.4	5.8	0	1.9
1996	DFF	11	3416	64	409	0.99	1.00	125	119	-6	-38	]0.05;0.1]	]100;500]	]0.1;0.5]	]0;0.1]	34.3	8.6	0	5.7
1997	DFF	3	3416	64	577	0.9	1.00	81	91	10	-11	]0;0.05]	]0;100]	]0.01;0.1]	]0;0.1]	21.3	0	0	0
1997	DFF	5	3416	64	381	0.9	1.00	81	91	10	-2	]0.1;0.5]	]100;500]	]0.1;0.5]	]0;0.1]	51.6	6.5	0	3.2
1997	DFF	10	3416	64	274	0.9	1.00	81	91	10	-10	]0.05;0.1]	]100;500]	]0.1;0.5]	]0;0.1]	47.8	13	0	4.3
1999	DFF	3	3416	64	94	0.96	1.00	156	73	-83	-130	]0.5;1]	]500;1500]	]>2]	]0.5;2]	90	70	10	50
1999	DFF	10	3416	64	662	0.97	1.00	78	73	-5	-51	]0.1;0.5]	]100;500]	]0.1;0.5]	]0;0.1]	36.8	18.4	0	15.8
1999	DFF	11	3416	64	803	0.97	0.50	78	73	-5	-50	]0.1;0.5]	]0;100]	]0.01;0.1]	]0;0.01]	19.6	0	0	0
2002	DFF	4	3416	64	146	0.91	0.13	79	119	40	-32	[0]	[0]	[0]	[0]	0	0	0	0
2004	DFF	4	3416	64	231	1	0.80	80	76	-4	-19	]0.1;0.5]	]100;500]	]0.1;0.5]	]0;0.1]	36.8	26.3	0	5.3
2004	DFF	6	3416	64	269	1	0.40	80	62	-18	-19	]0.1;0.5]	]0;100]	]0.1;0.5]	]0;0.1]	12.5	4.2	0	0
2005	DFF	3	3416	64	148	0.87	0.13	75	144	69	-33	[0]	[0]	[0]	[0]	0	0	0	0
2005	DFF	5	3416	64	66	0.87	0.13	75	144	69	-16	[0]	[0]	[0]	[0]	0	0	0	0
2006	DFF	4	3416	64	118	1	0.13	75	94	19	-15	[0]	[0]	[0]	[0]	0	0	0	0
2006	DFF	6	3416	64	126	1	0.13	75	94	19	-15	[0]	[0]	[0]	[0]	0	0	0	0
2007	DFF	10	3416	64	304	0.93	0.13	75	51	-24	-31	]0.5;1]	]100;500]	]0.1;0.5]	]0;0.1]	41.7	20.8	0	0
2007	DFF	11	3416	64	350	0.93	0.13	75	51	-24	-31	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.01]	3.6	3.6	0	3.6
2008	DFF	6	3416	64	119	0.93	0.15	170	127	-43	-73	[0]	[0]	[0]	[0]	0	0	0	0
2009	DFF	3	3416	64	119	1	0.26	79	93	14	-20	[0]	[0]	[0]	[0]	0	0	0	0
2009	DFF	5	3416	64	94	1	0.26	79	93	14	-18	[0]	[0]	[0]	[0]	0	0	0	0
2011	DFF	3	3416	64	94	0.74	0.32	70	98	28	-2	]0;0.05]	]0;100]	]0;0.01]	]0;0.01]	10	0	0	0
2011	DFF	5	3416	64	152	0.74	0.32	70	98	28	1	]0.05;0.1]	]0;100]	]0.01;0.1]	]0;0.1]	17.6	0	0	0
2011	DFF	10	3416	64	236	0.74	0.77	70	98	28	0	[0]	[0]	[0]	[0]	0	0	0	0
2011	DFF	11	3416	64	360	0.74	0.77	70	98	28	0	]0;0.05]	]0;100]	]0;0.01]	[0]	3.4	0	0	0
2012	DFF	4	3416	64	600	0.35	0.77	74	105	31	25	]0.05;0.1]	]0;100]	]0.1;0.5]	]0;0.1]	5.8	3.8	0	3.8
2012	DFF	6	3416	64	320	0.35	0.13	84	105	21	16	[0]	[0]	[0]	[0]	0	0	0	0
2013	DFF	10	3416	64	131	0.95	0.48	180	43	-137	-141	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.1]	22.2	16.7	0	11.1
2013	DFF	11	3416	64	285	0.95	0.48	180	43	-137	-141	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.1]	9.1	3	0	3
2014	DFF	6	3416	64	476	1	0.58	176	66	-110	-119	]0.1;0.5]	]100;500]	]0.1;0.5]	]0;0.1]	5.4	5.4	0	2.7
2015	DFF	3	3416	64	182	1	0.77	95	103	8	-31	]0;0.05]	]0;100]	]0.01;0.1]	]0;0.01]	5.3	0	0	0
2015	DFF	5	3416	64	265	1	0.77	95	103	8	-27	]0.05;0.1]	]0;100]	]0.1;0.5]	]0;0.1]	26.1	17.4	0	8.7
2017	DFF	4	3416	64	34	0.55	0.64	76	158	82	4	[0]	[0]	[0]	[0]	0	0	0	0
2017	DFF	5	3416	64	10	0.51	0.77	74	158	84	7	[0]	[0]	[0]	[0]	0	0	0	0
2017	DFF	6	3416	64	37	0.55	0.64	76	158	82	4	[0]	[0]	[0]	[0]	0	0	0	0
2003	FLU	6	401	39	320	0.42	1.00	236	62	-174	-184	]0;0.05]	]100;500]	]0.1;0.5]	]0;0.1]	4.2	4.2	0	0
2010	FLU	3	401	39	111	0.37	0.88	235	88	-147	-165	]0;0.05]	]0;100]	]0.01;0.1]	]0;0.1]	11.1	0	0	0
2010	FLU	5	401	39	147	0.37	0.88	235	88	-147	-154	[0]	[0]	[0]	[0]	0	0	0	0
2011	FLU	10	401	39	40	0.74	0.50	70	98	28	0	]0;0.05]	]0;100]	]0.01;0.1]	]0;0.1]	20	0	0	0
2011	FLU	11	401	39	73	0.74	0.50	70	98	28	0	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.1]	20	20	0	0
2012	FLU	4	401	39	372	0.35	0.50	74	105	31	25	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.01]	5.9	5.9	0	0

2012	FLU	7	401	39	157	0.8	1.00	260	105	-155	-161	[0]	[0]	[0]	[0]	0	0	0	0
2012	FLU	8	401	39	172	0.8	1.00	260	105	-155	-160	[0]	[0]	[0]	[0]	0	0	0	0
2012	FLU	9	401	39	218	0.8	1.00	260	105	-155	-159	[0]	[0]	[0]	[0]	0	0	0	0
2013	FLU	3	401	39	210	1	0.31	60	43	-17	-21	]0.1;0.5]	]100;500]	]0.5;2]	]0.1;0.5]	21.4	14.3	0	0
2013	FLU	5	401	39	248	1	0.31	60	43	-17	-19	]0.5;1]	]500;1500]	]0.5;2]	]0.5;2]	25	19.4	5.6	5.6
2015	FLU	3	401	39	182	1	0.50	95	103	8	-31	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.1]	10.5	5.3	0	0
2015	FLU	4	401	39	317	0.42	0.31	60	103	43	7	[0]	[0]	[0]	[0]	0	0	0	0
2015	FLU	5	401	39	265	1	0.50	95	103	8	-27	]0.1;0.5]	]100;500]	]0.5;2]	]0.1;0.5]	26.1	26.1	4.3	4.3
2015	FLU	6	401	39	476	0.42	0.31	60	103	43	7	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.01]	2.7	2.7	0	0
2015	FLU	10	401	39	239	0.42	0.31	60	103	43	6	[0]	[0]	[0]	[0]	0	0	0	0
2015	FLU	11	401	39	483	0.42	0.31	60	103	43	6	[0]	[0]	[0]	[0]	0	0	0	0
2015	FLU	6	401	39	147	0.42	0.31	60	103	43	7	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.01]	5	0.1	0	0
2017	FLU	4	401	39	34	0.55	0.42	76	158	82	4	[0]	[0]	[0]	[0]	0	0	0	0
2017	FLU	5	401	39	10	0.51	0.50	74	158	84	7	[0]	[0]	[0]	[0]	0	0	0	0
2017	FLU	6	401	39	37	0.55	0.42	76	158	82	4	[0]	[0]	[0]	[0]	0	0	0	0
1994	IPU	11	122	23	452	0.99	1.00	159	103	-56	-59	]>1]	]>2000]	]>2]	]>2]	67	67	33	33
1994	IPU	4	122	23	450	0.99	1.00	159	103	-56	-119	]0.5;1]	]>2000]	]>2]	]>2]	78	67	55.5	0
1995	IPU	10	122	23	500	0.95	1.00	85	22	-63	-76	]0.1;0.5]	]>2000]	]>2]	]>2]	60	60	0	0
1995	IPU	3	122	23	500	0.95	1.00	85	22	-63	-77	]0.5;1]	]>2000]	]>2]	]>2]	72	64	18.2	18.2
1996	IPU	11	122	23	108	0.99	1.00	125	119	-6	-38	]0.1;0.5]	]1500;2000]	]>2]	]0.5;2]	100	100	55.5	36
1996	IPU	4	122	23	108	0.99	1.00	125	119	-6	-38	]0.1;0.5]	]500;1500]	]>2]	]0.5;2]	45	45	27.2	22
1997	IPU	10	122	23	165	0.9	1.00	81	91	10	-10	]0.1;0.5]	]1500;2000]	]>2]	]0.5;2]	64	64	21.5	18
1997	IPU	5	122	23	165	0.9	1.00	81	91	10	-2	]0.5;1]	]>2000]	]>2]	]>2]	92	92	30.7	25
1997	IPU	3	122	23	165	0.9	1.00	81	91	10	-11	]0;0.05]	]100;500]	]0.5;2]	]0.1;0.5]	35.7	36	0	0
1999	IPU	11	122	23	290	0.97	0.50	78	73	-5	-50	]0.05;0.1]	]100;500]	]0.5;2]	]0.1;0.5]	25	25	0	0
1999	IPU	10	122	23	290	0.97	1.00	78	73	-5	-50	]0.1;0.5]	]>2000]	]>2]	]0.5;2]	56	56	18.8	18.8
1999	IPU	3	122	23	290	0.96	1.00	156	73	-83	-130	]>1]	]>2000]	]>2]	]>2]	80	80	40	20
2000	IPU	4	122	23	328	1	0.60	76	20	-56	-50	]0.5;1]	]>2000]	]>2]	]>2]	62.5	56	18.8	25
2001	IPU	11	122	23	512	0.96	0.40	171	45	-126	-133	]>1]	]>2000]	]>2]	]>2]	100	100	54.5	33
2001	IPU	10	122	23	444	0.96	0.80	171	45	-126	-133	]0.1;0.5]	]>2000]	]>2]	]>2]	100	100	44.4	22
2001	IPU	5	122	23	512	0.96	0.80	171	45	-126	-132	]0.5;1]	]>2000]	]>2]	]>2]	100	100	55.5	33
2001	IPU	3	122	23	512	0.96	0.80	171	45	-126	-135	]0.5;1]	]>2000]	]>2]	]>2]	91.6	92	25	12.5
2002	IPU	4	122	23	144	0.91	0.40	79	119	40	-32	]0.1;0.5]	]500;1500]	]>2]	]0.1;0.5]	45.5	45	9	9
2003	IPU	11	122	23	321	0.98	0.80	100	62	-38	-47	]>1]	]>2000]	]>2]	]>2]	100	90	40	20
2003	IPU	10	122	23	321	0.98	0.40	100	62	-38	-48	]>1]	]>2000]	]>2]	]>2]	90	80	30	16
2004	IPU	6	122	23	230	1	0.40	80	62	-18	-19	]0.05;0.1]	]100;500]	]0.1;0.5]	]0.1;0.5]	26	17	0	0
2004	IPU	4	122	23	230	1	0.80	80	76	-4	-19	]0.1;0.5]	]1500;2000]	]0.5;2]	]0.5;2]	79	53	0	0
2005	IPU	5	122	23	9	0.87	0.80	75	144	69	-16	]0;0.05]	]0;100]	]0.01;0.1]	]0;0.1]	50	25	0	0
2005	IPU	3	122	23	9	0.87	0.80	75	144	69	-33	]0;0.05]	]0;100]	]0.01;0.1]	]0;0.1]	16.6	0	0	0
2006	IPU	6	122	23	121	1	0.80	75	94	19	-15	]0;0.05]	]100;500]	]0.5;2]	]0.1;0.5]	64.7	35	0	0
2006	IPU	4	122	23	121	1	0.80	75	94	19	-15	]0.05;0.1]	]500;1500]	]>2]	]0.5;2]	86.7	80	26.7	20
2007	IPU	11	122	23	257	0.93	0.40	75	51	-24	-31	]0.1;0.5]	]500;1500]	]0.5;2]	]0.1;0.5]	47	24	0	0
2007	IPU	10	122	23	257	0.93	0.80	75	51	-24	-31	]0.1;0.5]	]>2000]	]>2]	]0.5;2]	88	65	23.5	18
2007	IPU	5	122	23	257	1	0.40	48	50	2	-8	]0.1;0.5]	]>2000]	]>2]	]0.5;2]	55.5	28	11.1	11.1
2007	IPU	3	122	23	257	1	0.40	48	50	2	-8	]0;0.05]	]100;500]	]0.5;2]	]0;0.1]	32	8	0	0
2009	IPU	5	122	23	113	1	0.40	79	93	14	-18	]0;0.05]	]0;100]	]0.01;0.1]	]0;0.1]	37.5	0	0	0
2009	IPU	3	122	23	113	1	0.40	79	93	14	-20	]0;0.05]	]0;100]	]0.1;0.5]	]0;0.1]	16.7	6	0	0
2011	IPU	5	122	23	115	0.74	0.40	70	98	28	1	]0.1;0.5]	]1500;2000]	]>2]	]0.5;2]	100	83	50	25
2011	IPU	3	122	23	115	0.74	0.40	70	98	28	-2	]0.05;0.1]	]100;500]	]0.5;2]	]0.5;2]	85.7	43	0	0
2013	IPU	11	122	23	334	0.95	0.48	180	42	-138	-141	]0.1;0.5]	]1500;2000]	]>2]	]0.5;2]	27.2	27	13.6	0.09
2013	IPU	10	122	23	334	0.95	0.48	180	43	-137	-141	]0.1;0.5]	]1500;2000]	]>2]	]0.5;2]	100	100	75	50