

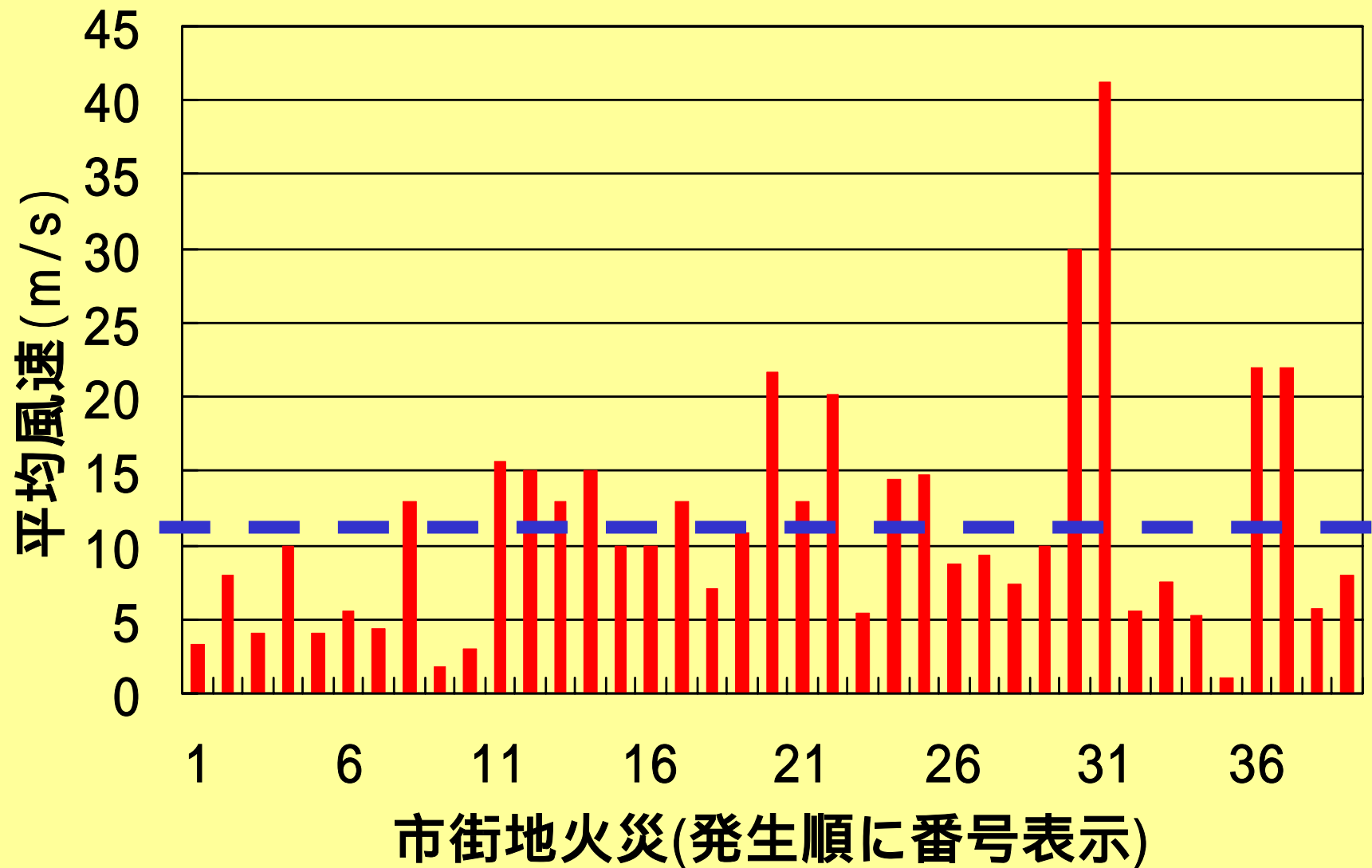


# 市街地火災の 延焼メカニズム

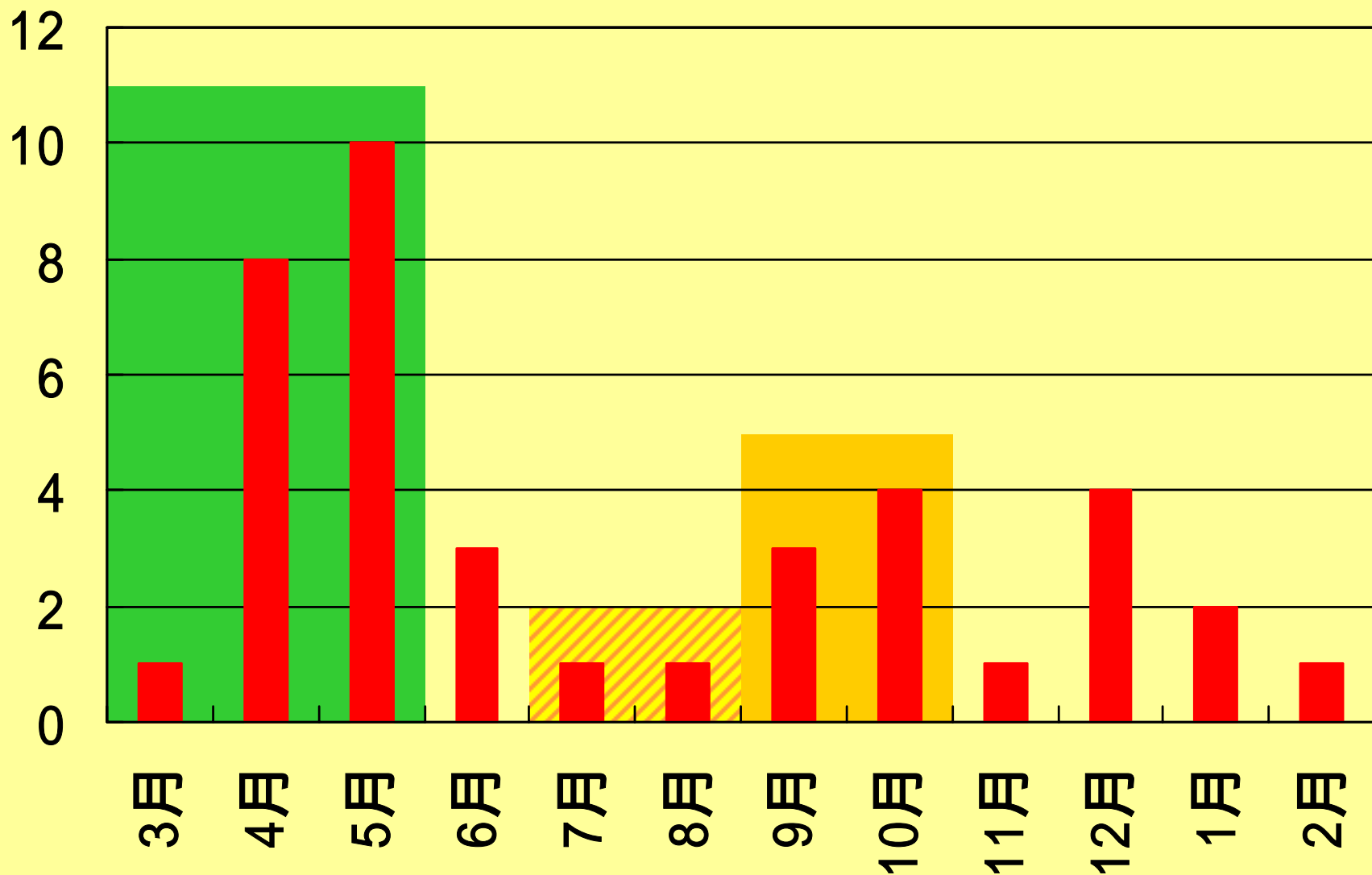
火災に強いまちづくりの実現に向けて

防火研究グループ 林 吉彦

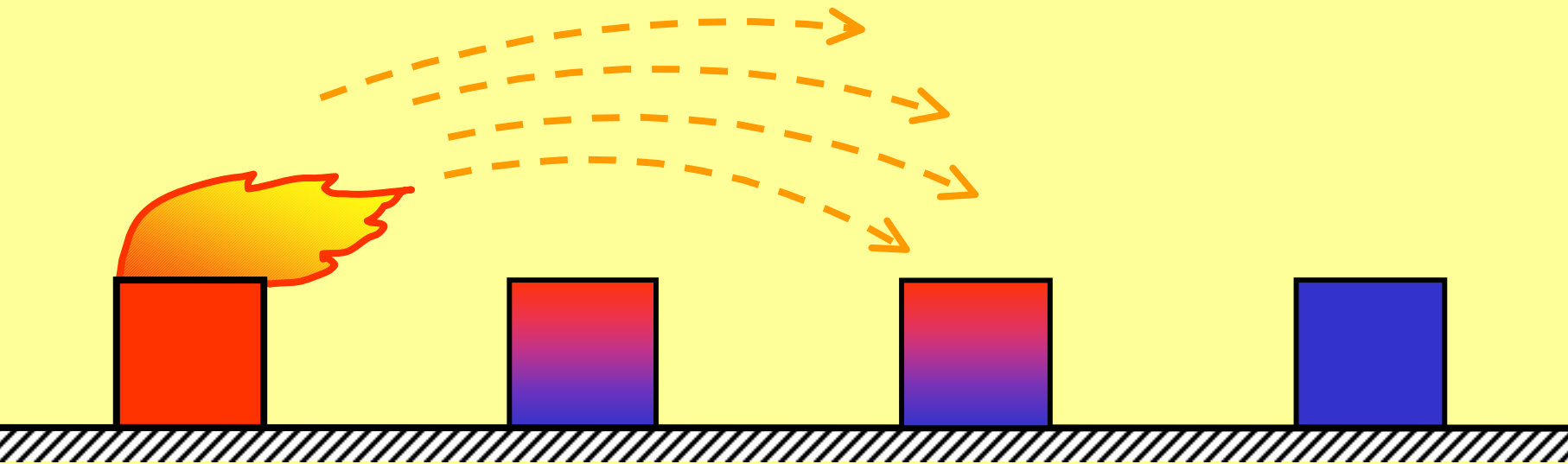
# 市街地火災と平均風速



# 月別の件数

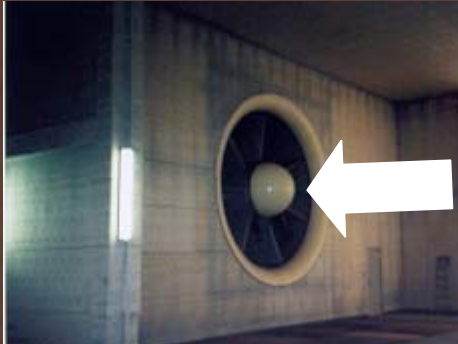


# 市街地火災の延焼要因

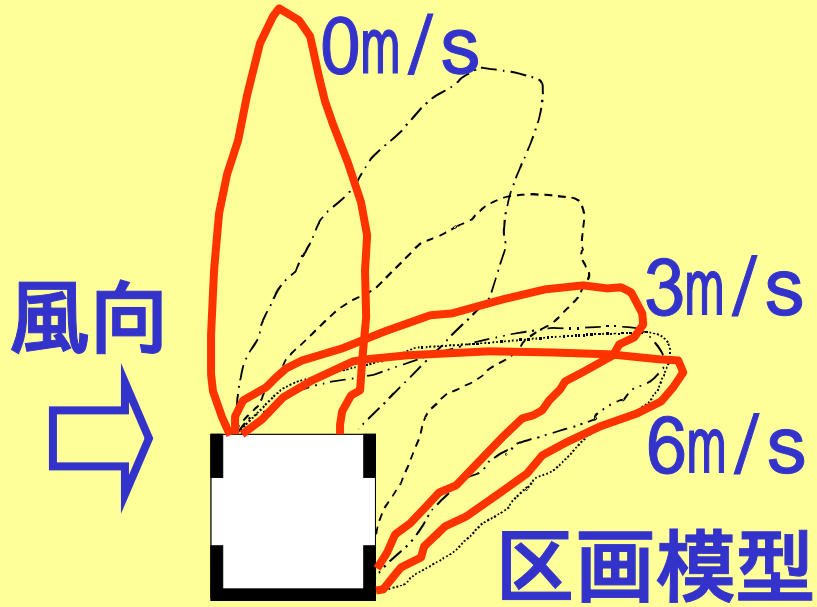
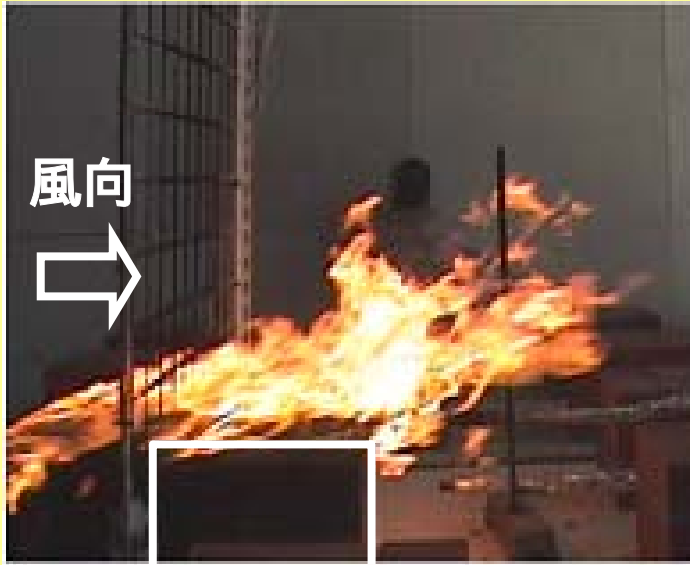


対流

# 火災風洞実験棟 (1998年4月完成)



# 火災風洞実験の成果



10m/s



96,000kW



10.0	0	0	0	0	0	0	0	0	0	0	0.02	0.1	0.35	0.96	2.11	3.97	6.62	10	14.1	18.6	23.5	28.4	33.3	38	42.4	46.4	50.1	53.2	56	58.3	60.2	61.8	63	63.9	64.5	64.8	65	64.9	64.7	64.4	63.9	63.3	62.6	61.9	61.1	60.2	59.4	58.4			
9.5	0	0	0	0	0	0	0	0	0.01	0.06	0.26	0.81	1.94	3.89	6.75	10.5	15.1	20.2	25.7	31.3	36.8	42	46.8	51.2	55.1	58.4	61.3	63.7	65.6	67.1	68.2	68.9	69.4	69.6	69.5	69.3	68.9	68.3	67.7	66.9	66.1	65.1	64.2	63.1	62.1	61	60				
9.0	0	0	0	0	0	0	0	0	0	0.03	0.18	0.65	1.75	3.76	6.86	11.1	16.2	22.1	28.3	34.6	40.8	46.6	51.9	56.7	60.9	64.4	67.4	69.7	71.6	73	73.9	74.5	74.8	74.7	74.5	74	73.4	72.6	71.7	70.7	69.7	68.5	67.4	66.2	65	63.7	62.5	61.2			
8.5	0	0	0	0	0	0	0	0	0.01	0.11	0.5	1.53	3.59	6.95	11.6	17.5	24.2	31.3	38.5	45.5	52.1	58	63.1	67.6	71.3	74.3	76.6	78.4	79.6	80.3	80.7	80.4	79.8	79.1	78.2	77.1	76	74.8	73.5	72.1	70.7	69.3	67.9	66.5	65.1	63.7	62.3				
8.0	0	0	0	0	0	0	0	0	0.01	0.06	0.36	1.29	3.38	7	12.3	19	26.7	34.9	43.2	51.2	58.5	65	70.7	75.4	79.2	82.2	84.4	86	87	87.4	87.5	87.1	86.5	85.6	84.6	83.3	82	80.5	79	77.4	75.8	74.2	72.6	70.9	69.3	67.7	66.1	64.6	63.1		
7.5	0	0	0	0	0	0	0	0.03	0.23	1.04	3.1	7	12.9	20.7	29.7	39.3	48.9	58	66.2	73.5	79.5	84.5	88.4	91.3	93.3	94.6	95.3	95.3	95	94.2	93.2	91.9	90.4	88.8	87.1	85.3	83.5	81.6	79.7	77.8	75.9	74	72.2	70.4	68.6	66.9	65.2	63.6			
7.0	0	0	0	0	0	0	0	0.01	0.13	0.78	2.76	6.92	13.6	22.7	33.3	44.6	55.8	66.3	75.6	83.5	90.1	95.2	99.1	102	103	104	105	104	103	102	100	98.7	96.7	94.7	92.5	90.3	88.1	85.9	83.6	81.5	79.3	77.2	75.1	73.1	71.1	69.2	67.4	65.6	63.9		
6.5	0	0	0	0	0	0	0	0.06	0.53	2.36	6.75	14.4	25	37.7	51.2	64.4	76.5	87	95.7	103	108	112	114	115	115	115	114	112	110	108	106	103	101	98.2	95.5	92.9	90.3	87.7	85.2	82.7	80.4	78	75.8	73.6	71.5	69.5	67.5	65.7	63.8		
6.0	0	0	0	0	0	0	0	0.02	0.31	1.9	6.46	15.2	27.8	43.2	59.4	75.1	89.2	101	111	118	123	126	128	128	128	127	125	122	120	117	114	110	107	104	101	97.8	94.8	91.8	89	86.2	83.5	80.9	78.4	76	73.7	71.5	69.4	67.4	65.4	63.6	
5.5	0	0	0	0	0	0	0.15	1.39	5.99	15.9	31.3	50.1	70	88.9	105	119	129	136	141	143	144	144	142	140	137	133	129	125	122	118	114	110	106	103	99.3	96	92.7	89.6	86.6	83.7	81	78.4	75.9	73.5	71.2	69	66.9	64.9	63		
5.0	0	0	0	0	0	0	0.05	0.89	5.32	16.7	35.5	59.2	84	107	128	141	152	159	162	164	163	161	158	154	150	145	140	135	130	126	121	116	112	108	104	100	96.4	92.9	89.6	86.4	83.4	80.6	77.9	75.3	72.8	70.5	68.2	66.1	64.1	62.2	
4.5	0	0	0	0	0.01	0.46	4.41	17.3	40.9	71.3	103	131	153	170	180	186	188	188	185	181	176	170	164	157	151	145	139	133	128	123	118	113	108	104	99.9	96	92.4	88.9	85.7	82.6	79.7	76.9	74.3	71.8	69.4	67.2	65	63	61.1		
4.0	0	0	0	0	0	0.16	3.25	17.6	47.8	88.1	129	184	190	207	217	220	216	210	203	195	187	179	171	163	155	148	141	135	129	123	117	112	108	103	98.9	94.9	91.2	87.6	84.3	81.2	78.3	75.5	72.9	70.4	68	65.8	63.7	61.7	59.8		
3.5	0	0	0	0.02	1.96	17.4	57.1	112	161	211	240	256	263	262	257	249	239	228	216	205	194	184	174	165	157	149	141	134	128	122	116	111	106	101	97	93	89.3	85.8	82.5	79.4	76.4	73.7	71.1	68.6	66.3	64.1	62.1	60.1	58.2		
3.0	0	0	0	0.78	16.3	70.2	150	225	279	310	322	322	314	301	286	270	254	239	224	210	198	186	175	165	156	147	139	132	125	119	113	108	103	98.7	94.5	90.5	86.8	83.3	80.1	77	74.2	71.5	69	66.6	64.3	62.2	60.2	58.3	56.5		
2.5	0	0	0.12	13.4	89.5	212	318	382	409	411	398	377	353	328	305	282	262	243	226	210	196	183	172	161	152	143	135	128	122	115	110	105	99.8	95.3	91.2	87.3	83.7	80.4	77.2	74.3	71.6	69	66.5	64.2	62.1	60	58.1	56.3	54.5		
2.0	0	0	8.2	120	325	479	546	553	529	492	450	410	373	339	310	283	260	239	221	205	190	177	166	155	146	138	130	123	116	110	105	100	95.5	91.2	87.3	83.6	80.2	77	74	71.6	69.2	66.6	64.1	61.7	59.6	57.7	55.8	54.1	52.4		
1.5	0	1.97	177	586	781	812	759	681	602	530	468	415	371	333	300	273	249	228	210	194	180	168	157	147	138	130	123	116	110	105	99.4	94.8	90.5	86.5	82.8	79.4	76.2	73.2	70.4	67.8	65.4	63.1	60.9	58.9	56.9	55.1	53.4	51.8	50.2		
1.0	0	304	1206	1394	1239	1034	855	713	603	516	447	392	347	300	278	252	230	211	194	179	167	155	145	136	128	121	114	108	103	97.8	93.1	88.9	84.9	81.3	77.9	74.8	71.9	69.1	66.6	64.2	61.9	59.8	57.8	55.9	54.1	52.4	50.8	49.3	47.9		
0.5	765	3514	2604	1797	1299	987	780	635	531	452	391	343	305	273	246	224	205	188	174	162	151	141	132	124	117	111	105	100	95.1	90.6	86.5	82.6	79.1	75.8	72.8	69.9	67.3	64.8	62.5	60.3	58.2	56.3	54.5	52.8	51.1	49.6	48.1	46.7	45.4	44.2	43
0.0	7703	3057	1780	1213	901	707	575	481	411	358	315	280	252	228	208	191	176	163	152	142	133	125	118	111	105	100	95.1	90.6	86.5	82.6	79.1	75.8	72.8	69.9	67.3	64.8	62.5	60.3	58.2	56.3	54.5	52.8	51.1	49.6	48.1	46.7	45.4	44.2	43		



# 市街地火災の延焼予測モデル



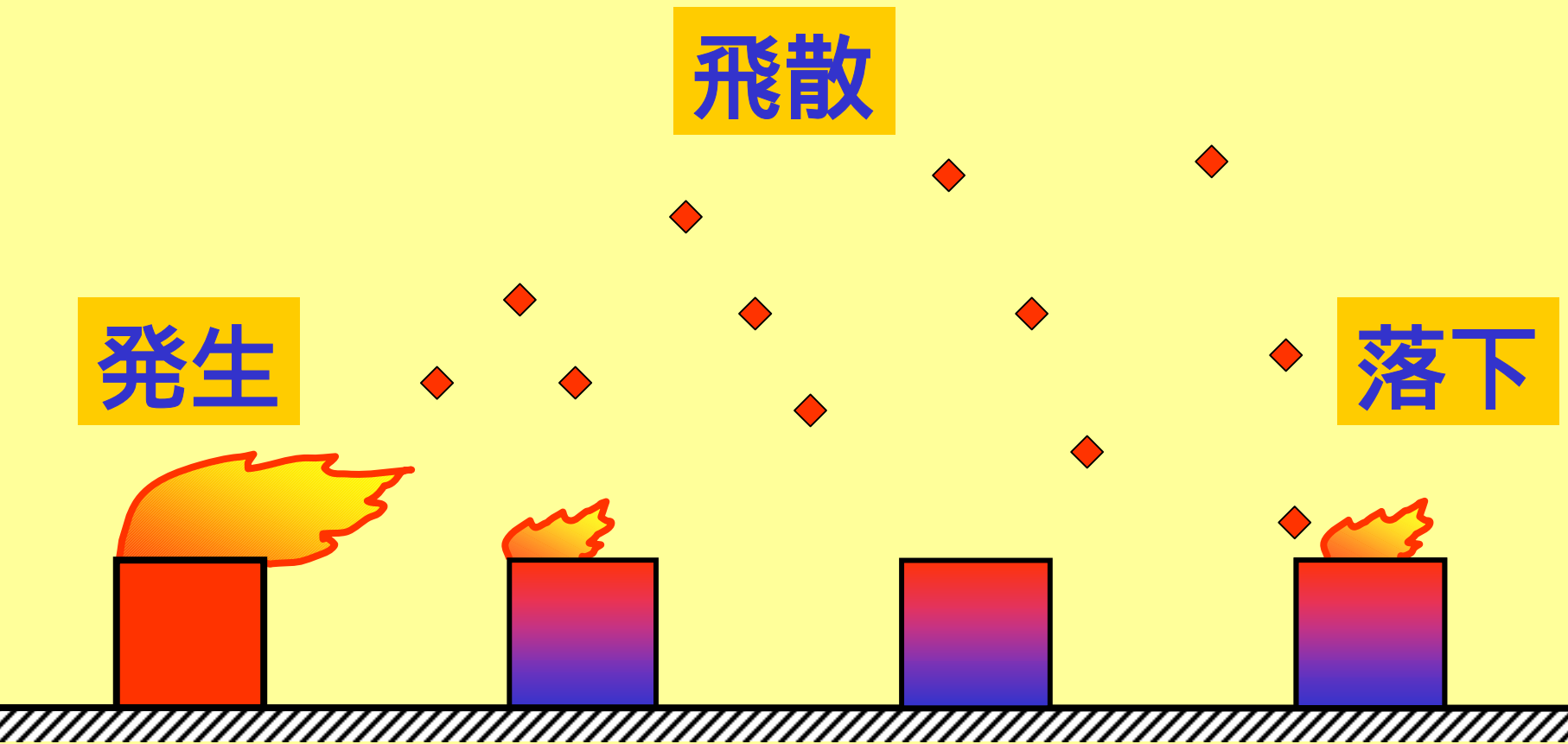


# 火の粉による飛び火に関する研究 (平成14,15年度)

飛散

発生

落下



飛び火

# 火災風洞実験の様子

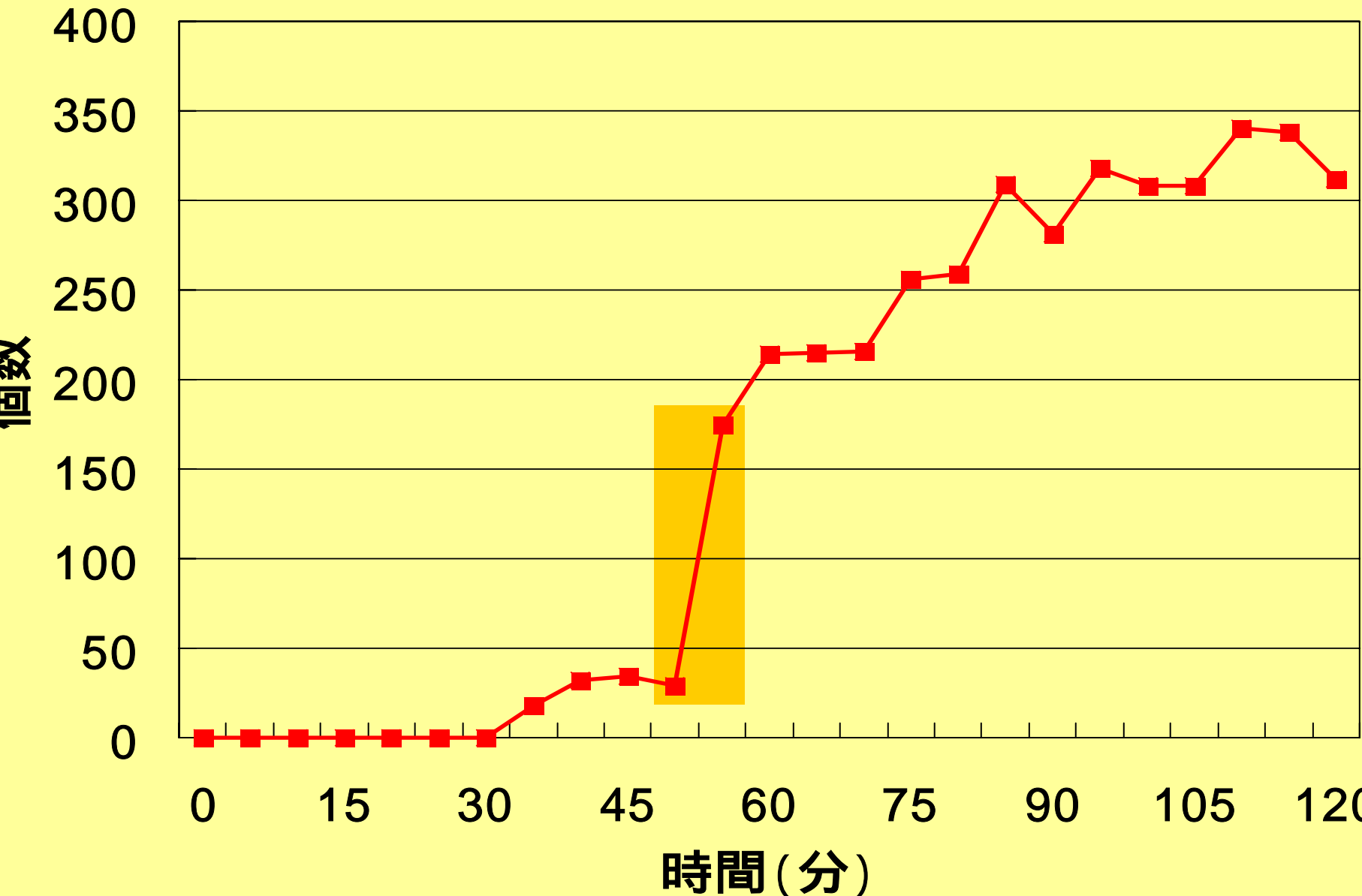


# 火の粉の発生の様子



風向  
→

# 火の粉の発生量



# 火の粉の捕集 (FO前後)

前

後



# フラッシュオーバー(室外から)

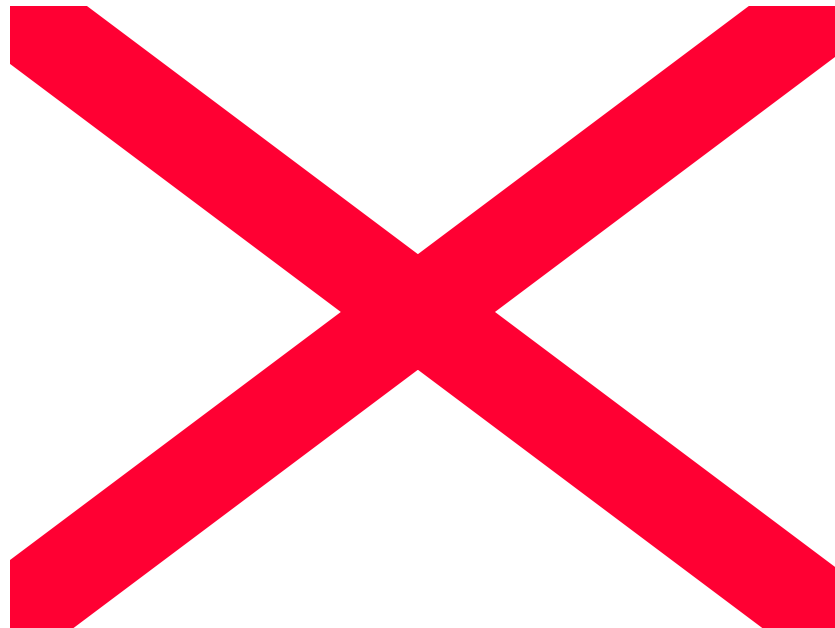




# フラッシュオーバー(室内)



# 室内の温度変化

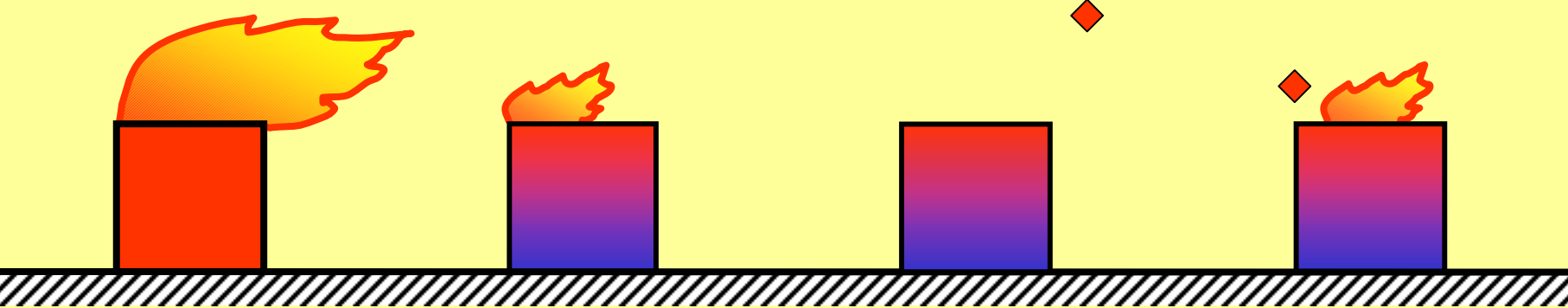


# 落下時着火の有無に関する研究成果

飛散

発生

落下

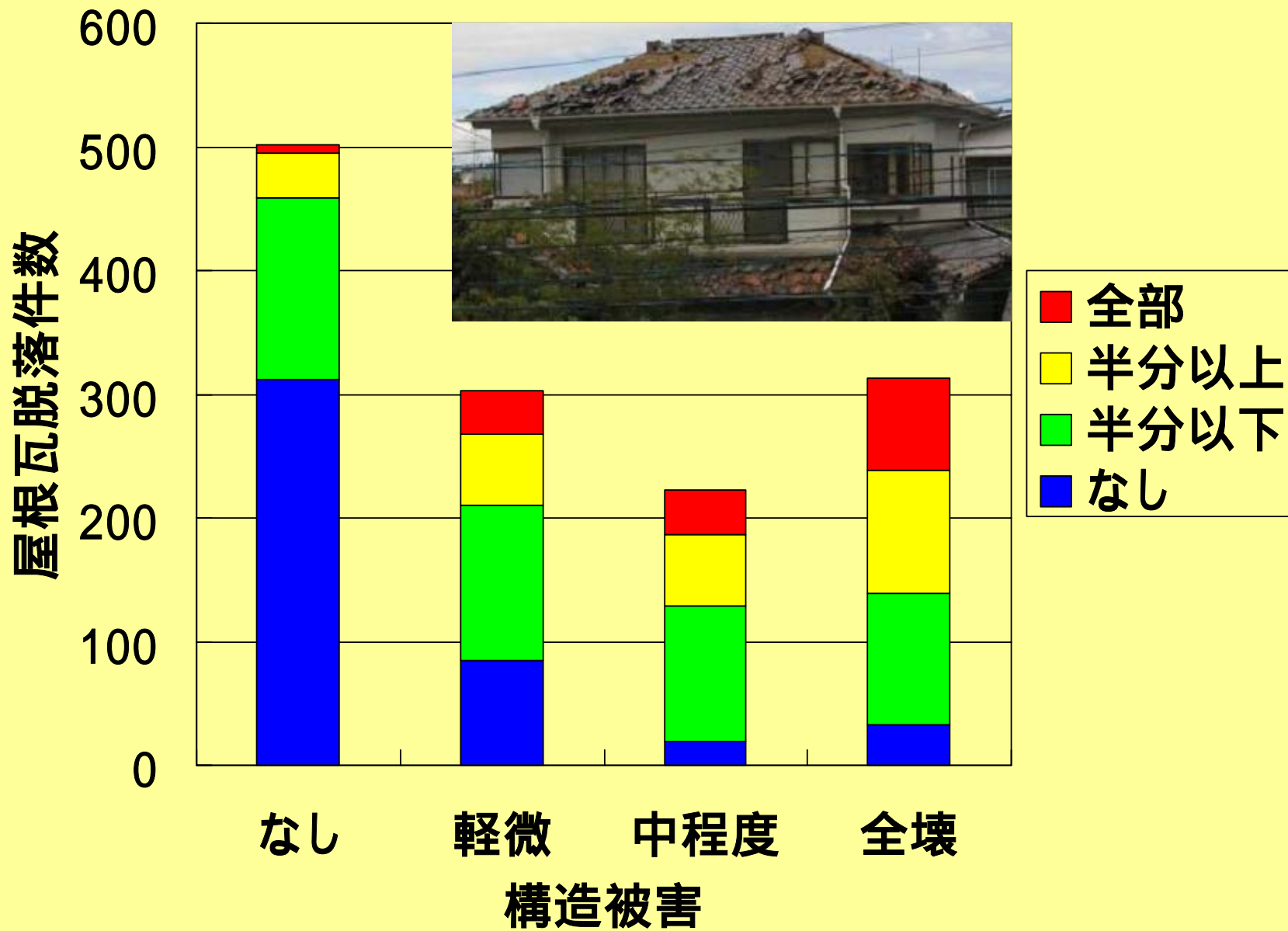


飛び火

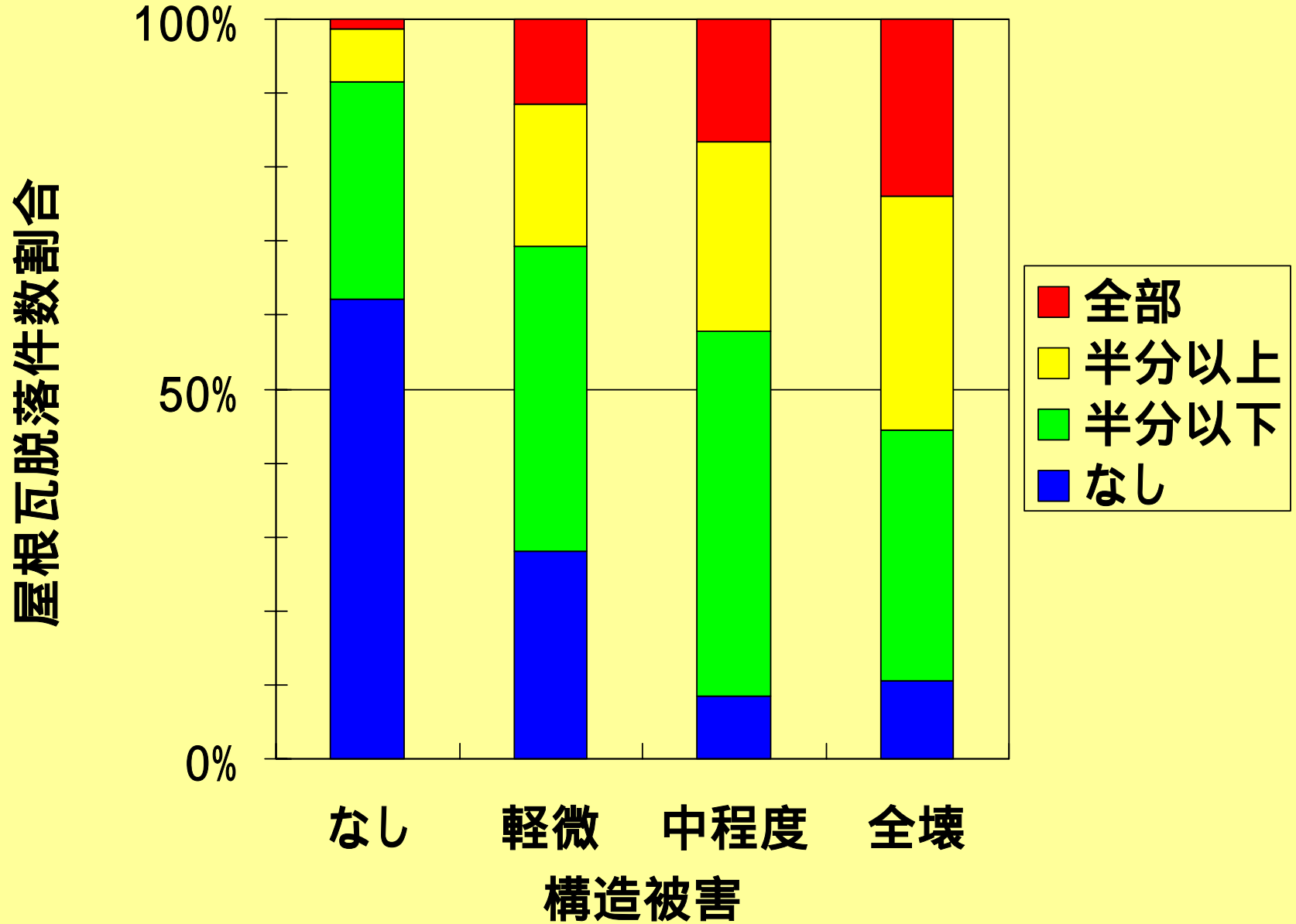
# 地震直後の屋根瓦脱落



# 構造被害別の屋根瓦脱落件数



# 構造被害別の屋根瓦脱落件数割合



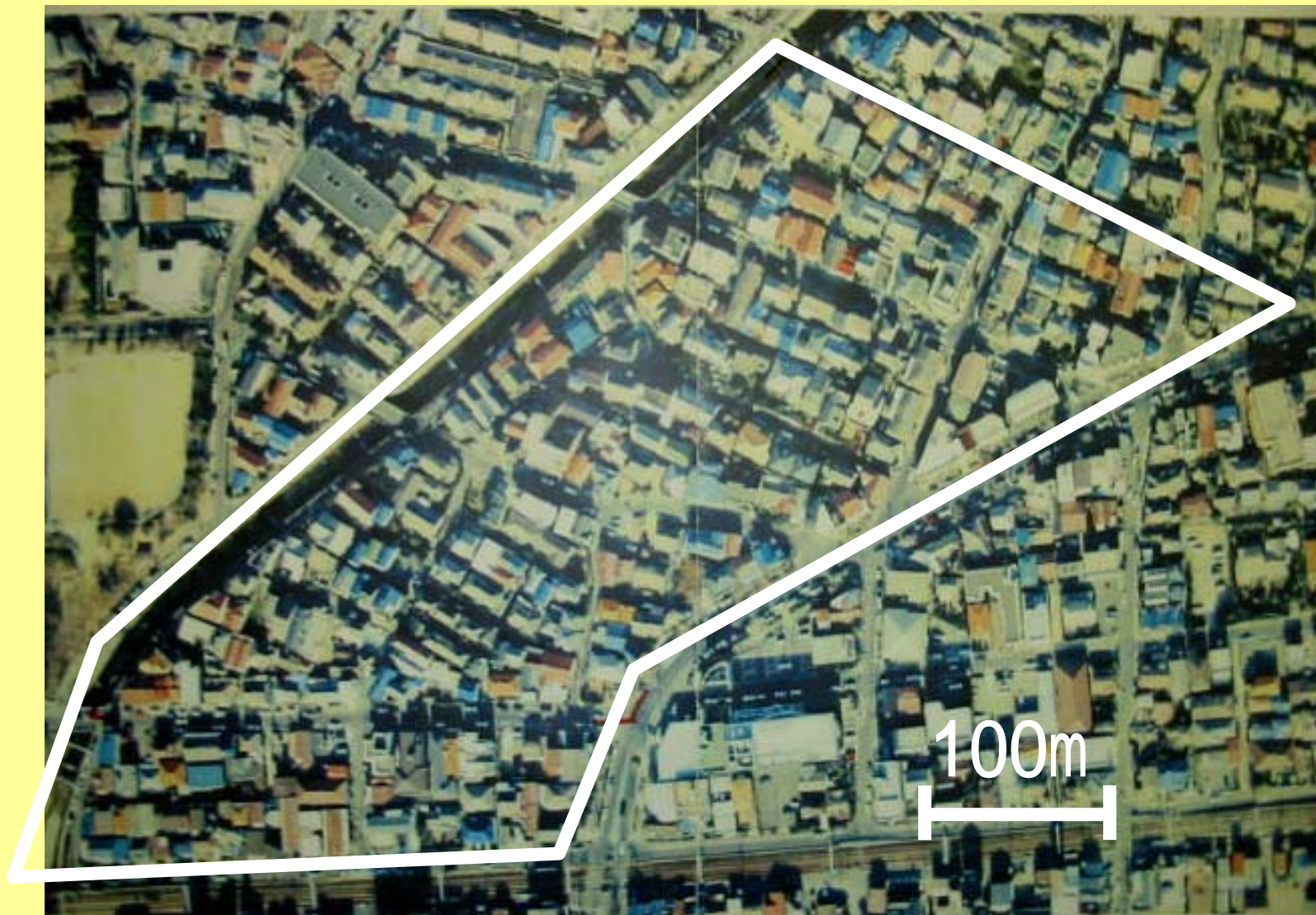


# 構造被害(現地調査結果)





# 屋根瓦被害(写真分析)



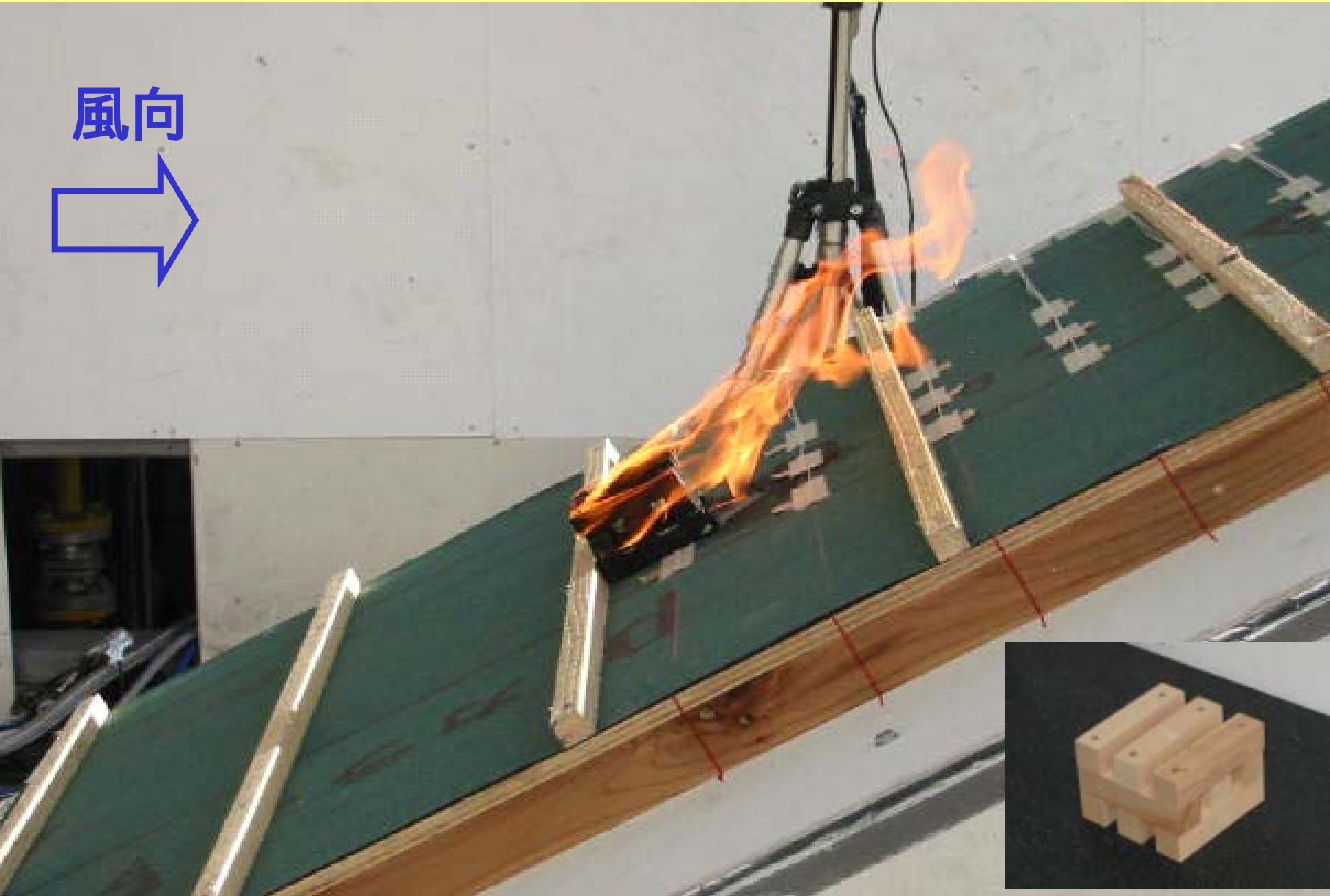
# 屋根試験体(瓦1枚脱落)



# 屋根試験体(瓦全脱落)



# 火種の設置



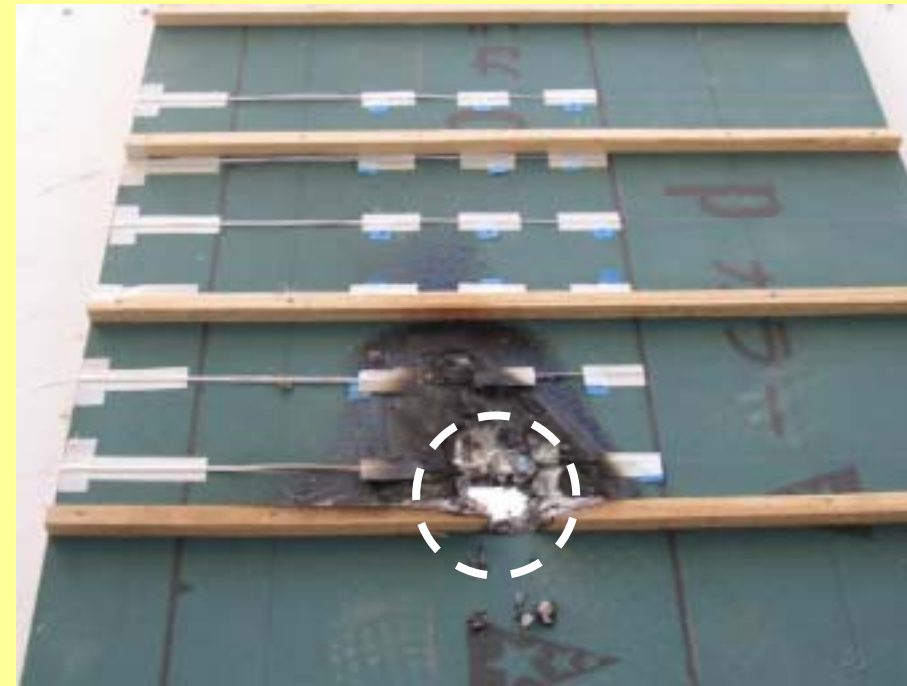


# 屋根の焼損(無風と有風)

無風下



有風下



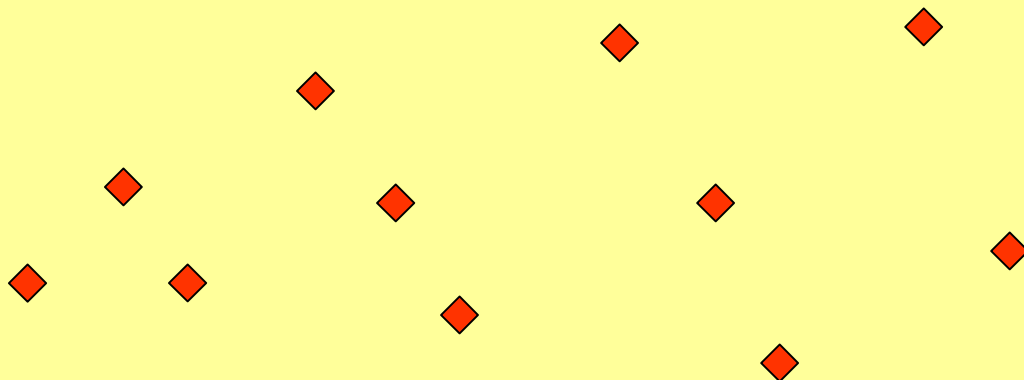
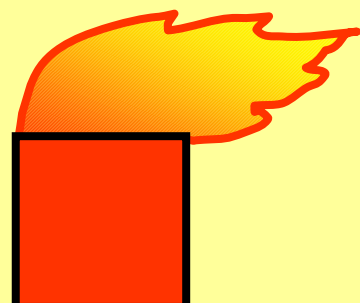


# 飛散範囲、飛散性状の変化 に関する研究成果

飛散

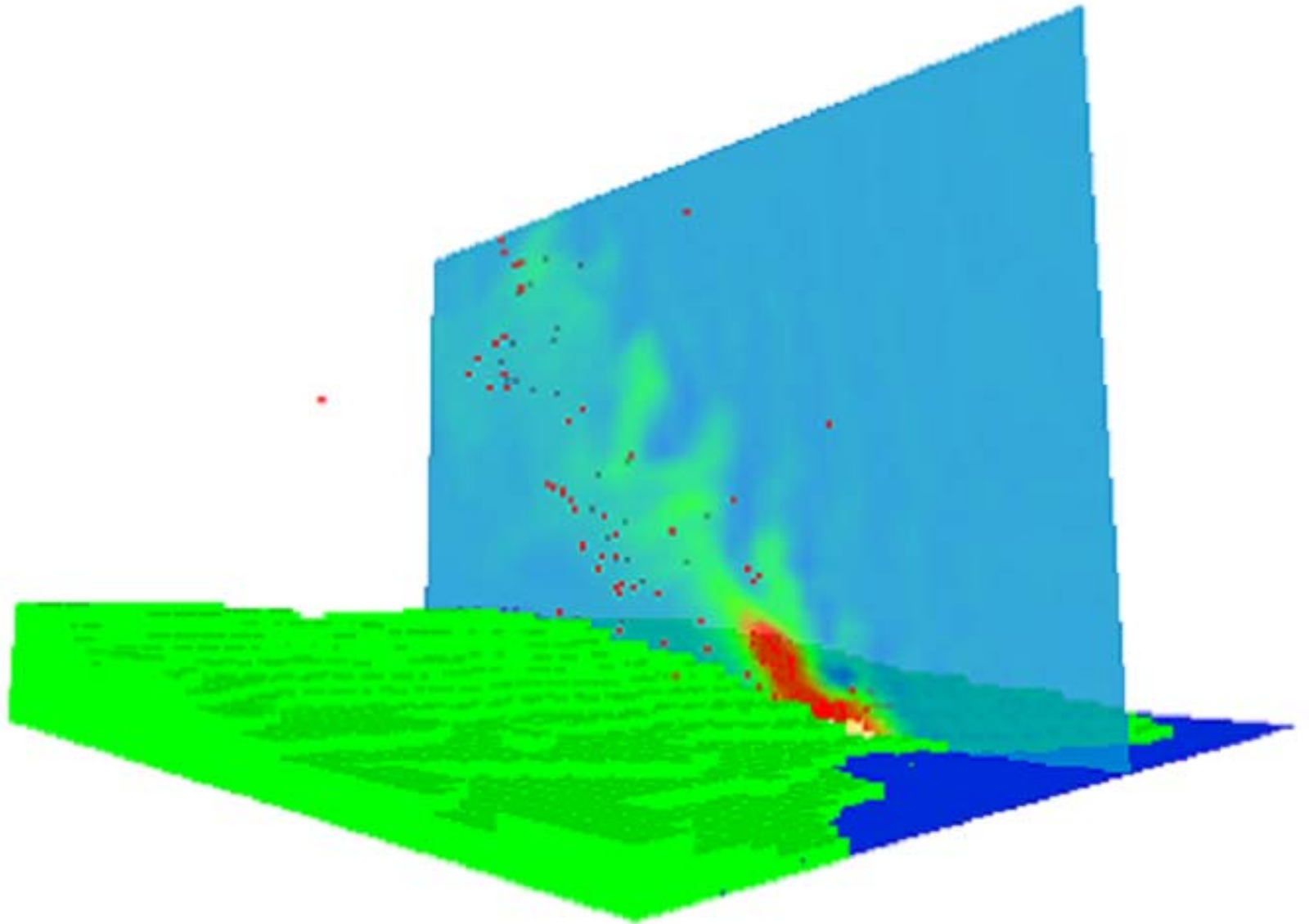
発生

落下



飛び火

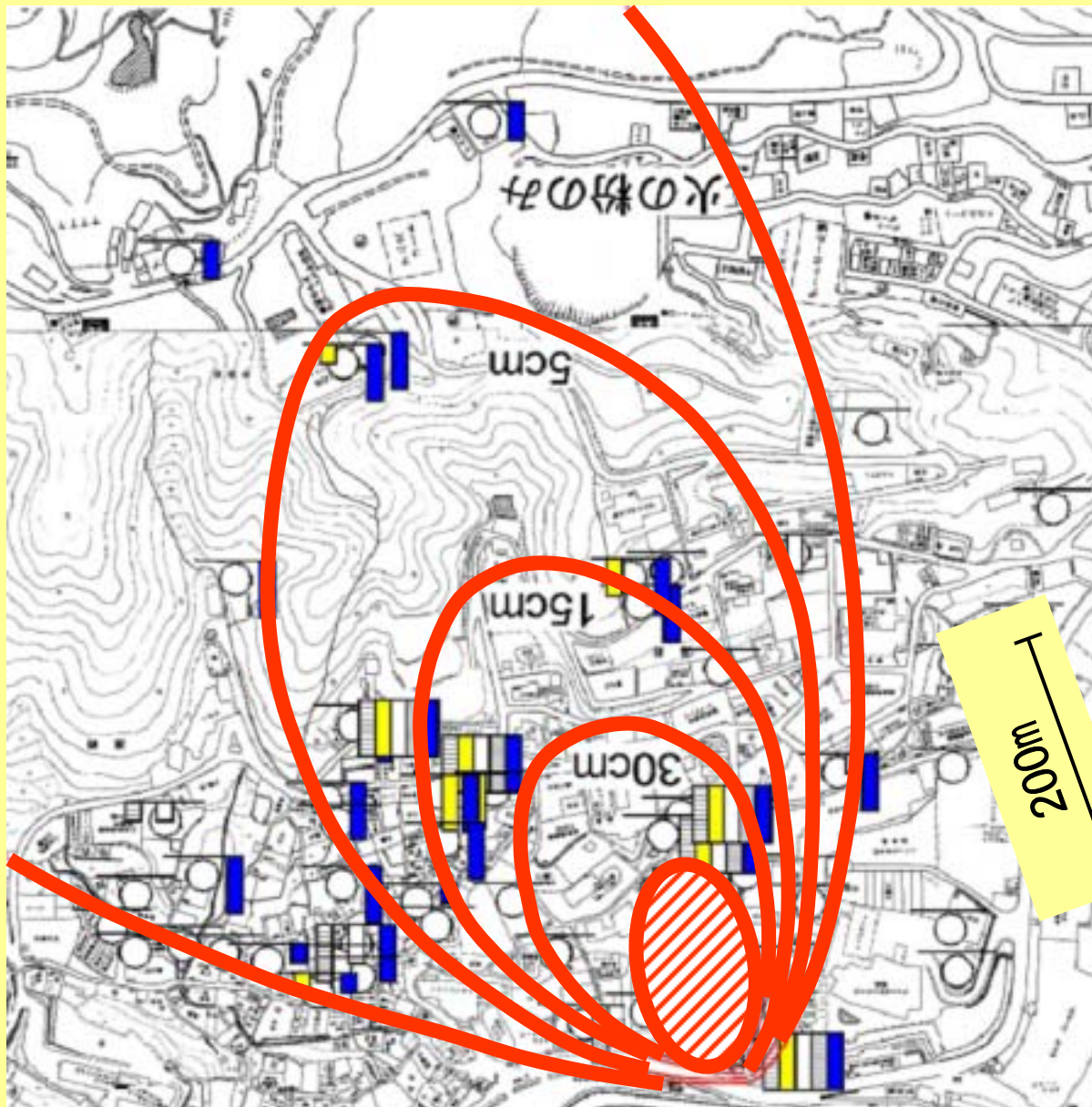
# 火の粉の飛散範囲の数値予測



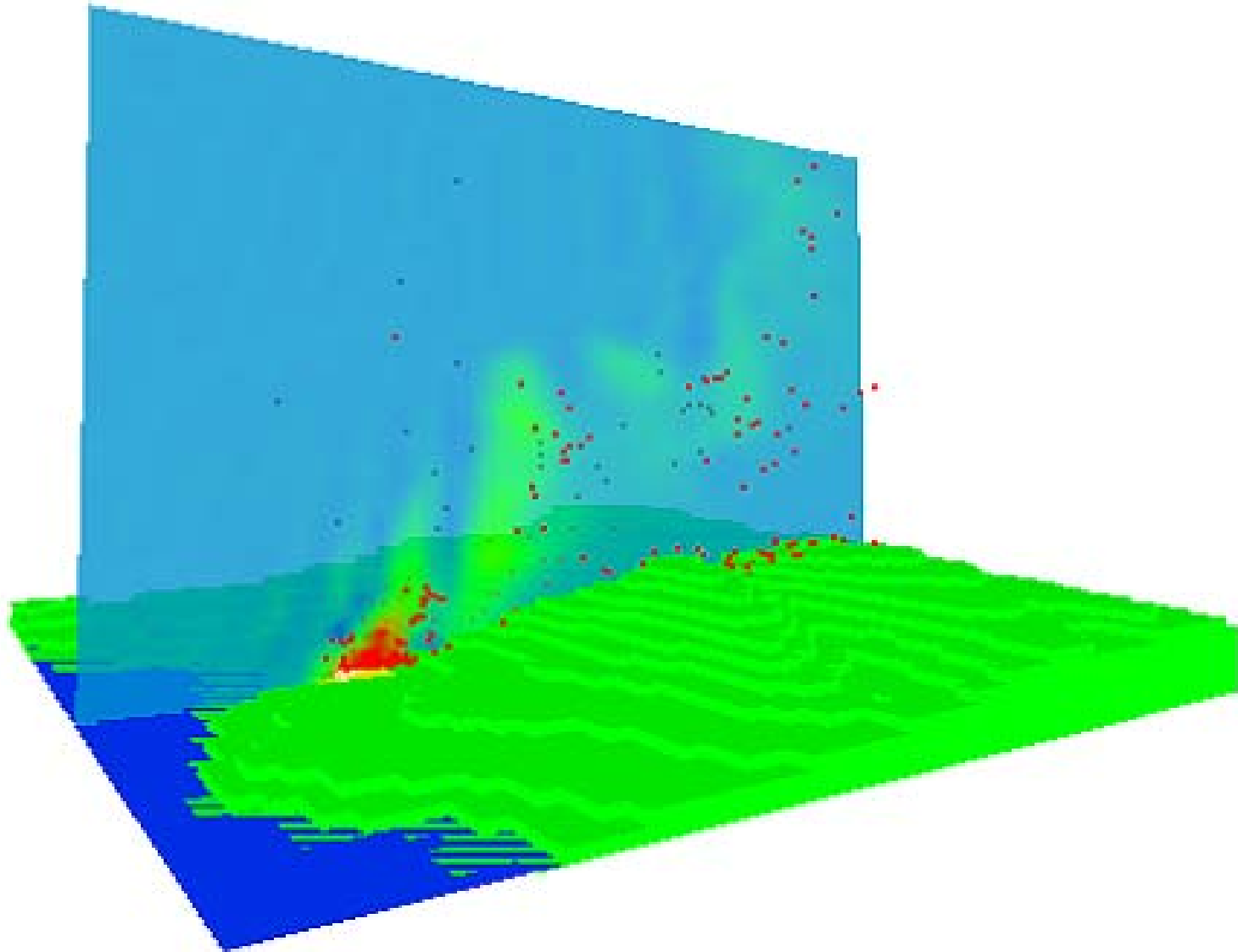
# 対象としたホテル火災の周辺状況



# 火の粉の飛散範囲(現地調査結果)



# 火の粉の飛散範囲の数値予測

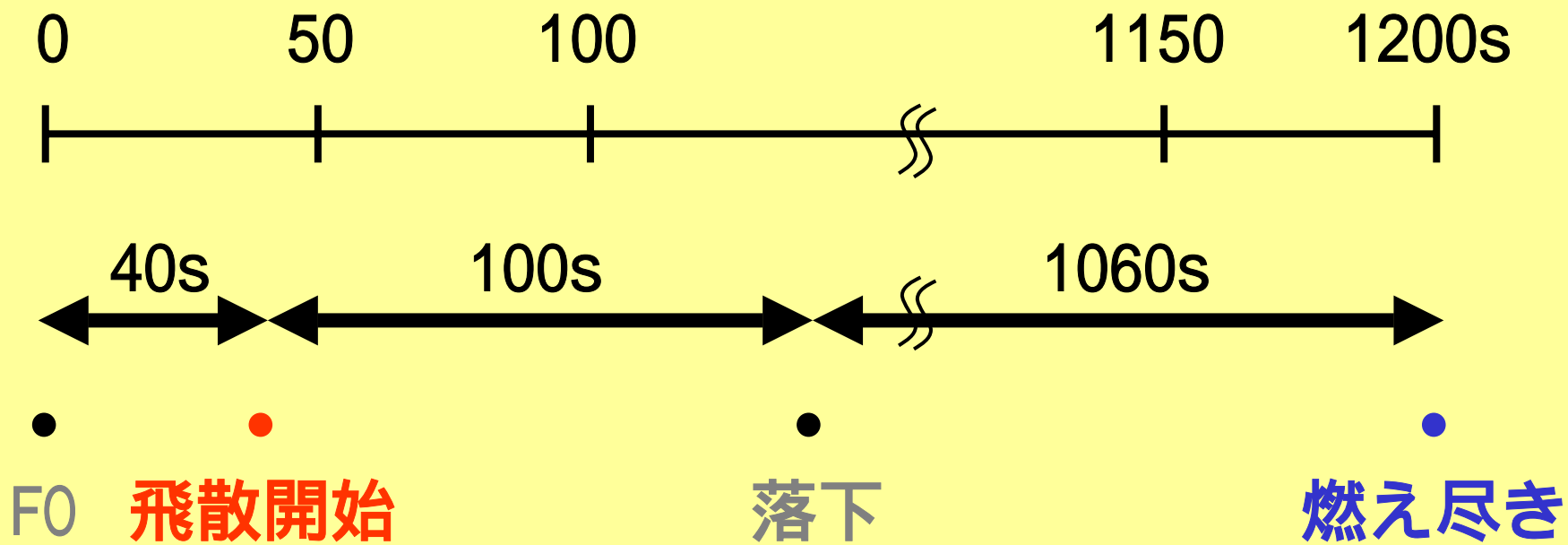




# コーンカロリー試験



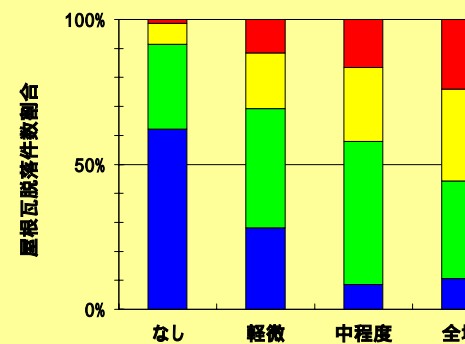
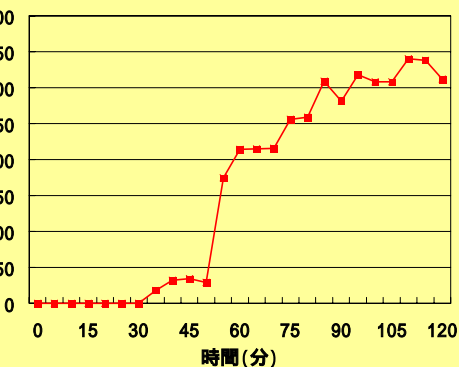
# 火の粉飛散性状 (コーン試験結果を基に)



0.31g/cm<sup>3</sup> → 0.18g/cm<sup>3</sup>

0.4kW → 0.11kW → 0kW

# 火の粉の跳躍延焼予測モデル





# 市街地火災の延焼予測モデル

