



Kompleks Bir Sahada Birden Fazla Ölçüm Direği Kullanılarak Yapılan Saha Modellemesi Ve Enerji Analizi

29 Eylül 2017

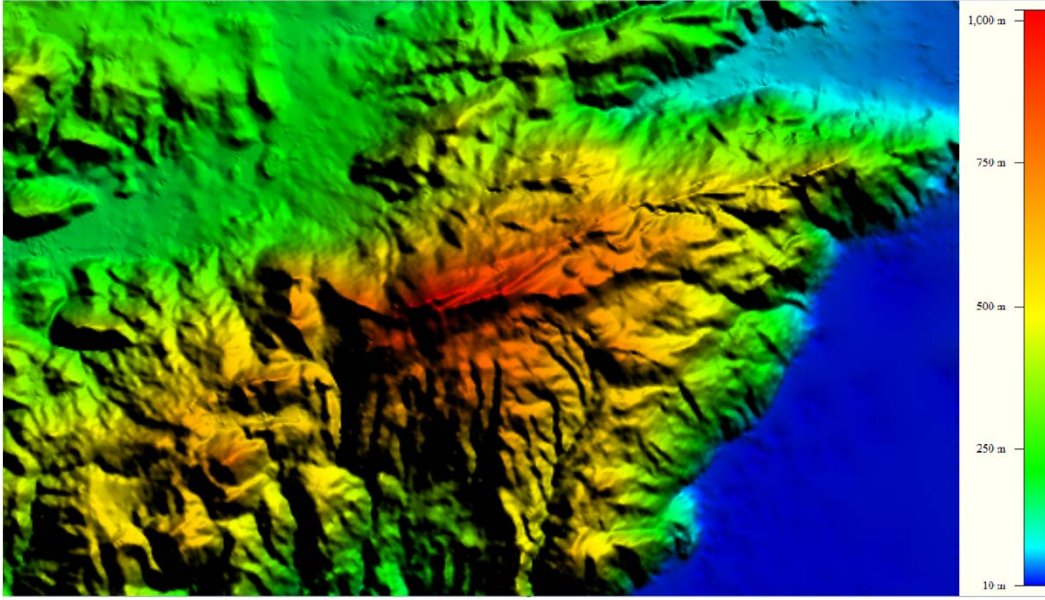
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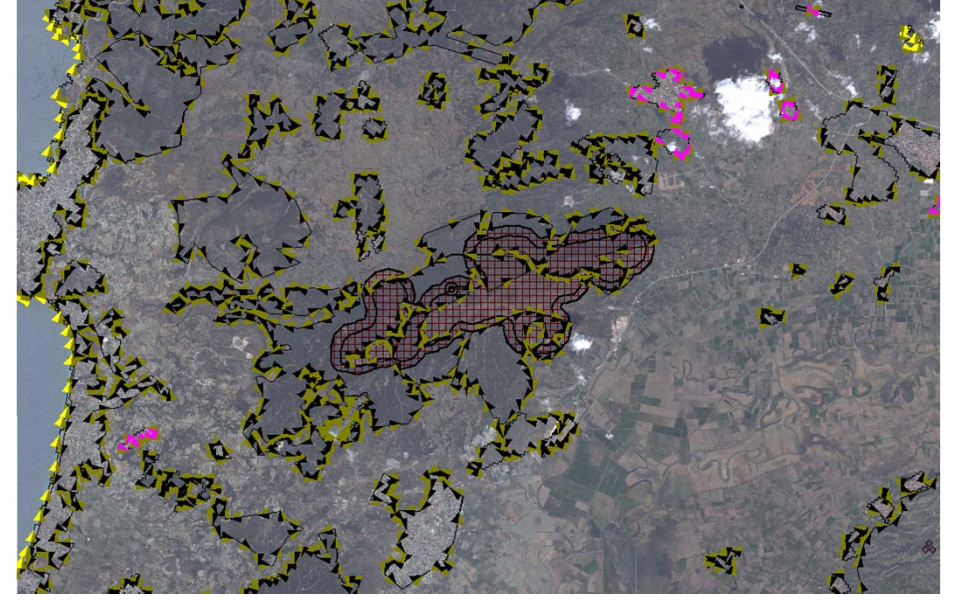
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1. Sahanın Özellikleri

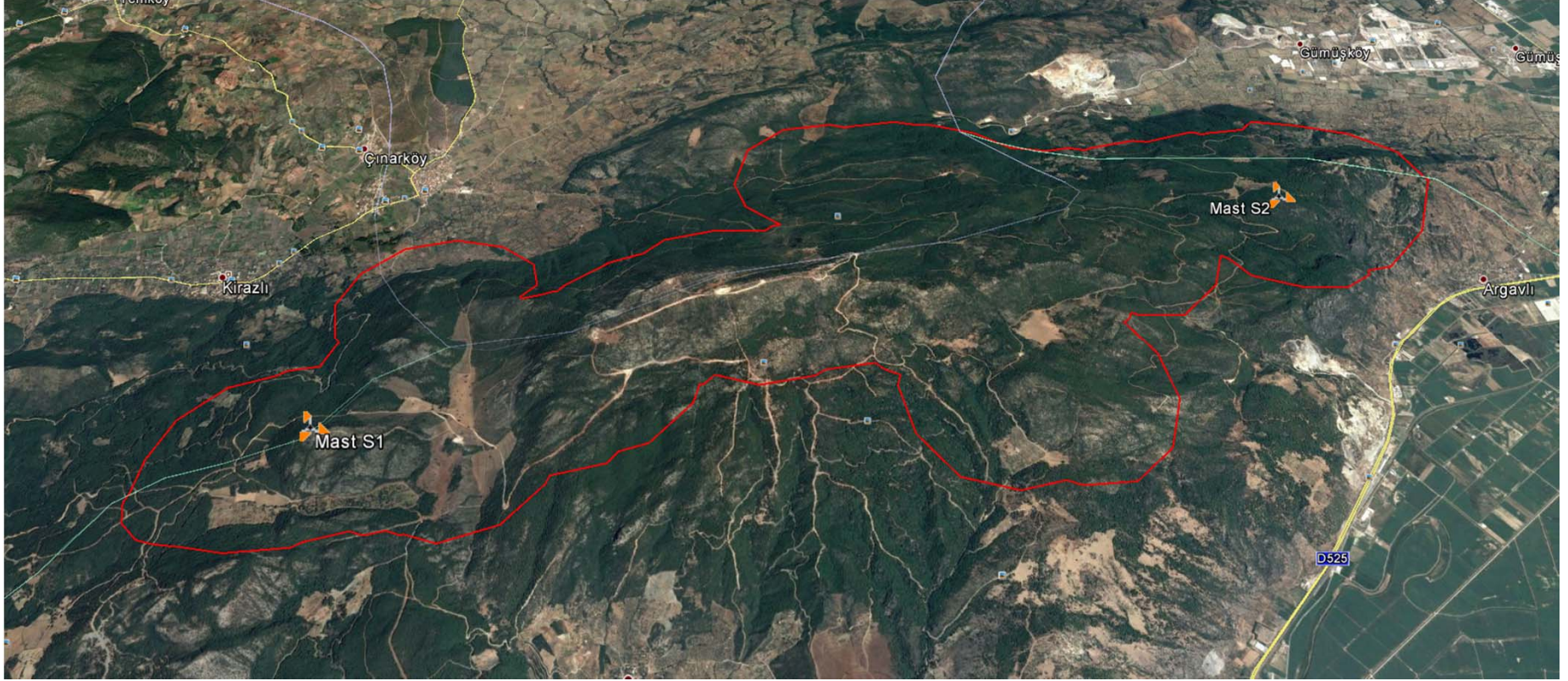


Eşyüksehti Haritası



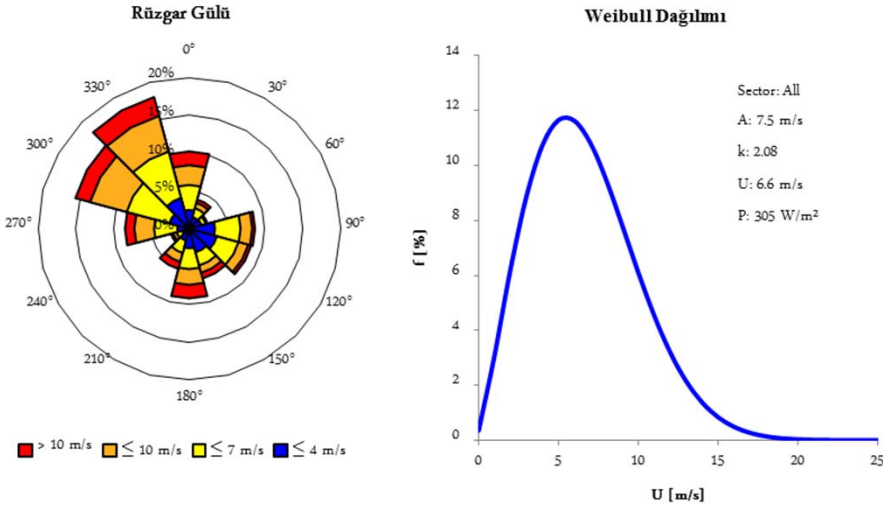
Pürüzlülük Haritası

2. Kullanılan Ölçüm Direkleri

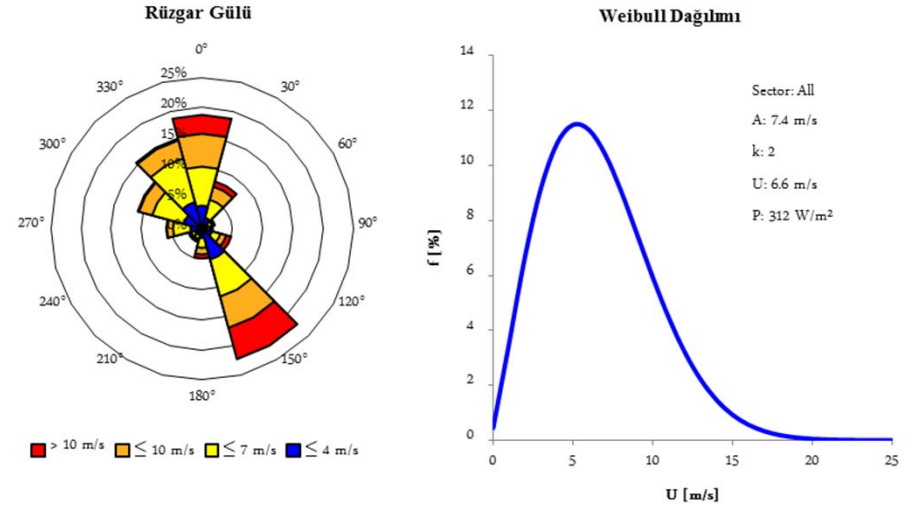


Ölçüm Direklerinin Konumu

2. Kullanılan Ölçüm Direkleri



Mast S1 Rüzgar Dağılımı



Mast S2 Rüzgar Dağılımı

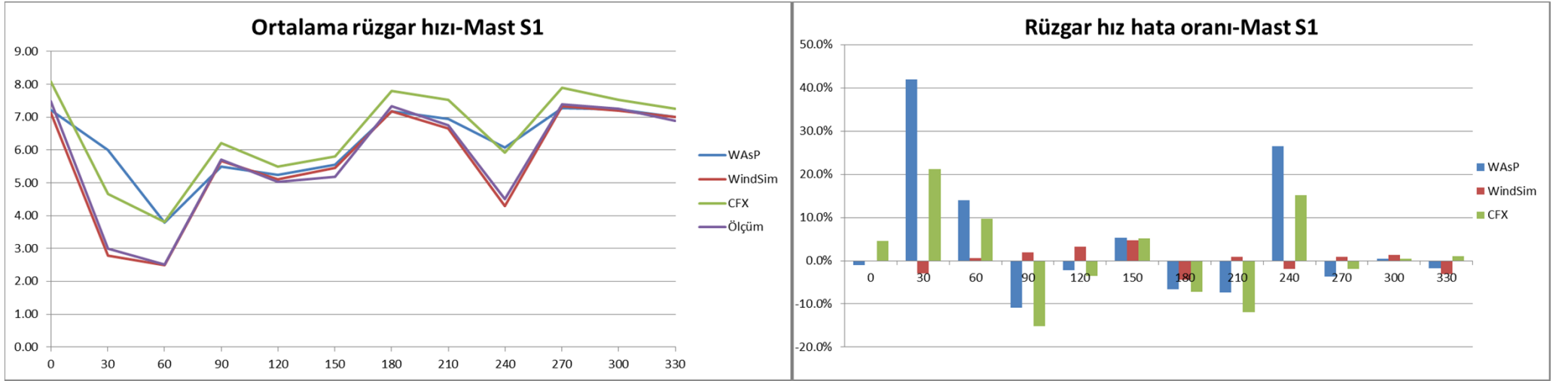
3. Kullanılan Modeller

- Lineer Model
 - WAsP
- Lineer Olmayan Model
 - WindSim
 - Ansys CFX

4. Karşılaştırmalı Model Çıktıları

		0	30	60	90	120	150	180	210	240	270	300	330	Tümü	Bağıl hata	Mutlak hata
Ortalama rüzgar hızı-Mast S1	WAsP	7.22	5.99	3.80	5.50	5.25	5.55	7.18	6.94	6.08	7.28	7.24	7.01	6.58		
	WindSim	7.14	2.77	2.49	5.67	5.10	5.46	7.18	6.65	4.29	7.33	7.19	7.00	6.48		
	CFX	8.08	4.67	3.80	6.20	5.49	5.80	7.79	7.52	5.92	7.90	7.53	7.25	7.16		
	Ölçüm	7.48	3.01	2.52	5.70	5.03	5.19	7.33	6.76	4.51	7.38	7.25	6.89	6.55		
Weibull k-Mast S1	WAsP	2.16	1.71	1.48	2.19	1.93	1.45	1.90	1.90	1.71	2.64	2.80	2.35			
	WindSim	2.19	1.20	1.81	2.34	2.03	1.42	1.95	1.92	1.15	2.57	2.95	2.43			
	CFX	2.57	1.81	2.41	2.49	2.07	1.33	2.10	2.28	1.43	2.81	3.25	2.44			
	Ölçüm	2.26	1.34	1.84	2.36	2.00	1.32	1.97	1.96	1.20	2.56	3.01	2.31			
Frekans-Mast S1	WAsP	10.2	4.0	2.5	8.7	8.5	6.8	9.2	5.5	2.4	8.5	15.6	18.0			
	WindSim	14.4	1.3	1.6	8.2	8.8	9.7	9.8	3.7	1.3	5.3	13.7	22.3			
	CFX	11.3	0.7	0.6	10.3	7.5	4.9	11.7	4.2	1.0	7.0	20.2	20.5			
	Ölçüm	11.5	1.7	1.6	10.0	8.6	5.9	11.1	4.5	1.4	6.4	18.3	19.1			
Rüzgar hız oranı - S1/S2	WAsP	1.01	0.86	0.63	0.88	0.73	0.72	1.06	1.22	1.19	1.28	1.25	1.17	0.99		
	WindSim	1.02	0.41	0.49	1.01	0.78	0.72	1.08	1.30	0.91	1.33	1.26	1.16	0.98		
	CFX	1.07	0.65	0.59	0.84	0.72	0.72	1.05	1.17	1.08	1.30	1.25	1.20	1.01		
	Ölçüm	1.02	0.44	0.49	0.99	0.75	0.67	1.12	1.29	0.92	1.32	1.24	1.19	0.99		
Rüzgar hız hata oranı	WAsP	-1.1%	42.0%	13.9%	-10.9%	-2.2%	5.3%	-6.6%	-7.4%	26.5%	-3.7%	0.5%	-1.7%	0.5%	8.1%	0.37
	WindSim	-0.1%	-3.0%	0.6%	1.9%	3.2%	4.8%	-4.4%	0.8%	-1.9%	0.8%	1.3%	-3.1%	-0.4%	2.7%	0.17
	CFX	4.6%	21.2%	9.7%	-15.1%	-3.5%	5.2%	-7.2%	-11.9%	15.2%	-2.0%	0.5%	1.0%	2.6%	7.3%	0.41

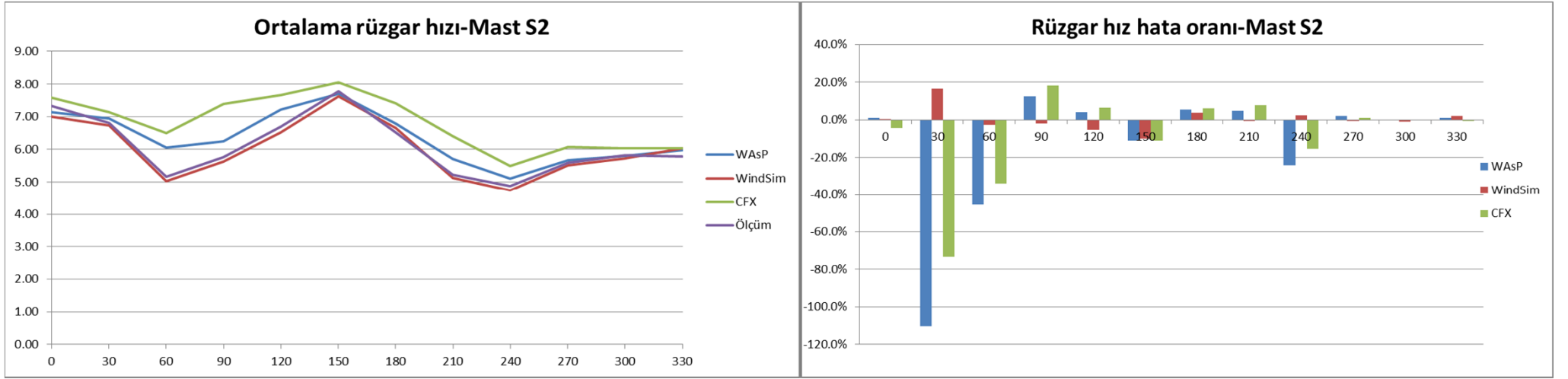
Mast S1 Model Çıktıları



Mast S1 Sektörel Hızlar ve Hata Oranları

		0	30	60	90	120	150	180	210	240	270	300	330	Tümü	Bağıl hata	Mutlak hata
Ortalama rüzgar hızı-Mast S2	WAsP	7.15	6.95	6.05	6.25	7.21	7.70	6.79	5.70	5.11	5.67	5.80	5.97	6.63		
	WindSim	7.00	6.74	5.03	5.63	6.52	7.63	6.65	5.12	4.74	5.52	5.73	6.04	6.59		
	CFX	7.58	7.15	6.49	7.40	7.67	8.05	7.41	6.41	5.50	6.07	6.03	6.04	7.06		
	Ölçüm	7.33	6.81	5.16	5.77	6.70	7.78	6.52	5.23	4.88	5.59	5.83	5.78	6.63		
Weibull k-Mast S2	WAsP	2.38	2.37	2.01	1.64	1.81	1.94	1.87	1.75	1.70	2.70	2.82	2.64			
	WindSim	2.39	2.49	1.57	1.44	1.67	1.95	1.93	1.57	1.40	2.79	2.91	2.55			
	CFX	2.49	2.66	2.23	1.99	2.05	2.04	2.42	2.05	1.52	3.20	2.96	2.93			
	Ölçüm	2.45	2.50	1.63	1.48	1.71	1.97	2.00	1.62	1.48	2.83	2.92	2.86			
Frekans-Mast S2	WAsP	15.7	9.2	3.6	3.0	7.3	17.7	5.9	3.3	2.9	7.0	10.1	14.3			
	WindSim	20.0	6.1	2.1	1.3	3.8	24.0	5.5	1.7	2.1	4.5	9.1	19.8			
	CFX	19.4	8.2	1.7	1.5	4.8	23.2	4.4	1.9	1.8	6.0	11.0	16.1			
	Ölçüm	18.8	8.1	2.2	1.8	5.0	22.3	4.9	2.3	2.3	5.9	11.0	15.4			
Rüzgar hız oranı - S2/S1	WAsP	0.99	1.16	1.59	1.14	1.37	1.39	0.95	0.82	0.84	0.78	0.80	0.85	1.01		
	WindSim	0.98	2.43	2.02	0.99	1.28	1.40	0.93	0.77	1.10	0.75	0.80	0.86	1.02		
	CFX	0.94	1.53	1.71	1.19	1.40	1.39	0.95	0.85	0.93	0.77	0.80	0.83	0.99		
	Ölçüm	0.98	2.26	2.05	1.01	1.33	1.50	0.89	0.77	1.08	0.76	0.80	0.84	1.01		
Rüzgar hız hata oranı	WAsP	1.1%	-110.4%	-45.4%	12.5%	4.1%	-11.0%	5.6%	4.7%	-24.1%	2.2%	-0.3%	1.2%	-0.5%	32.8%	2.21
	WindSim	0.1%	16.5%	-2.6%	-1.9%	-5.4%	-10.0%	3.6%	-0.5%	2.3%	-0.5%	-0.8%	2.2%	0.4%	6.9%	0.50
	CFX	-4.2%	-73.3%	-33.9%	18.2%	6.5%	-10.9%	6.1%	7.8%	-15.2%	1.1%	-0.3%	-0.7%	-2.6%	22.5%	1.52

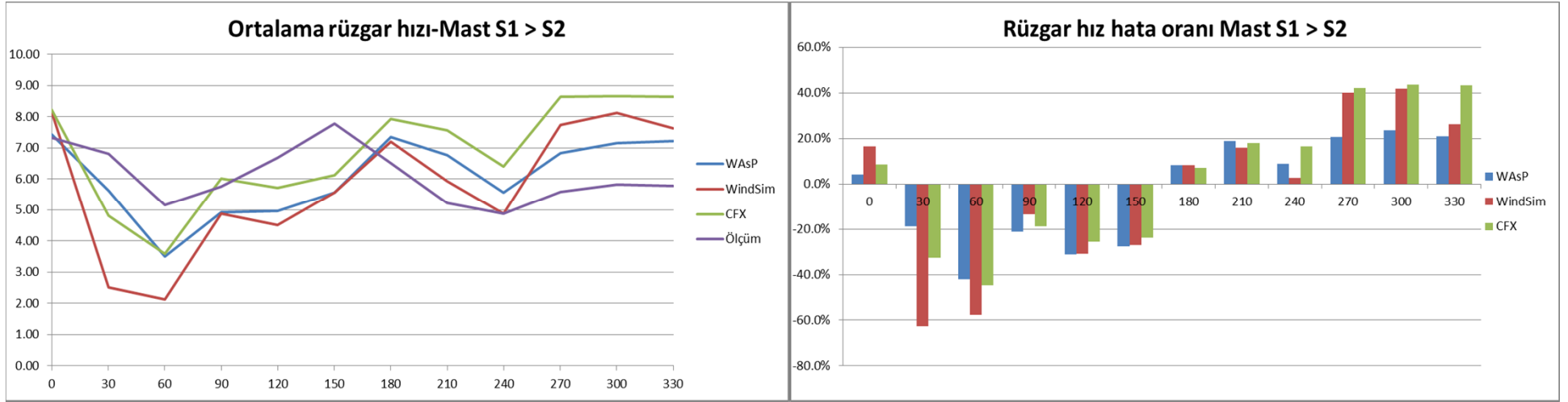
Mast S2 Model Çıktıları



Mast S2 Sektörel Hızlar ve Hata Oranları

		0	30	60	90	120	150	180	210	240	270	300	330	Tümü	Bağıl hata	Mutlak hata
Ortalama rüzgar hızı-Mast S1>S2	WAsP	7.45	5.64	3.50	4.93	4.97	5.57	7.35	6.77	5.56	6.85	7.17	7.22	6.51		
	WindSim	8.17	2.51	2.14	4.87	4.52	5.56	7.20	5.94	4.87	7.74	8.12	7.62	6.80		
	CFX	8.22	4.82	3.60	6.02	5.72	6.13	7.94	7.57	6.41	8.64	8.66	8.65	7.77		
	Ölçüm	7.33	6.81	5.16	5.77	6.70	7.78	6.52	5.23	4.88	5.59	5.83	5.78	6.63		
Weibull k-Mast S1>S2	WAsP	2.13	1.64	1.53	2.19	1.95	1.46	1.90	1.88	1.70	2.59	2.72	2.36			
	WindSim	2.08	1.26	1.77	2.37	2.08	1.40	1.91	1.94	1.15	2.53	2.97	2.39			
	CFX	2.50	1.80	2.36	2.54	2.11	1.37	2.16	2.31	1.45	2.73	3.26	2.47			
	Ölçüm	2.45	2.50	1.63	1.48	1.71	1.97	2.00	1.62	1.48	2.83	2.92	2.86			
Frekans-Mast S1>S2	WAsP	10.8	3.9	2.5	8.0	8.4	7.7	9.9	5.1	2.3	7.5	14.1	19.9			
	WindSim	13.3	1.2	1.6	7.5	8.3	11.4	9.7	3.1	1.3	4.6	14.4	23.5			
	CFX	10.7	0.7	0.5	9.4	8.5	6.1	12.1	2.8	0.9	5.8	21.1	21.5			
	Ölçüm	18.8	8.1	2.2	1.8	5.0	22.3	4.9	2.3	2.3	5.9	11.0	15.4			
Rüzgar hız oranı - S1>S2/S2	WAsP	1.04	0.81	0.58	0.79	0.69	0.72	1.08	1.19	1.09	1.21	1.24	1.21	0.98		
	WindSim	1.17	0.37	0.42	0.87	0.69	0.73	1.08	1.16	1.03	1.40	1.42	1.26	1.03		
	CFX	1.09	0.67	0.55	0.81	0.75	0.76	1.07	1.18	1.17	1.42	1.44	1.43	1.10		
	Ölçüm	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Rüzgar hız hata oranı	WAsP	4.2%	-18.9%	-42.1%	-21.1%	-31.1%	-27.6%	8.2%	18.8%	8.8%	20.8%	23.6%	21.0%	-1.8%	21.6%	1.44
	WindSim	16.6%	-62.8%	-57.5%	-13.4%	-30.7%	-27.1%	8.3%	16.1%	2.8%	40.2%	41.9%	26.3%	3.2%	32.6%	2.12
	CFX	8.6%	-32.5%	-44.6%	-18.7%	-25.4%	-23.9%	7.2%	18.1%	16.6%	42.3%	43.5%	43.2%	10.0%	30.4%	1.89

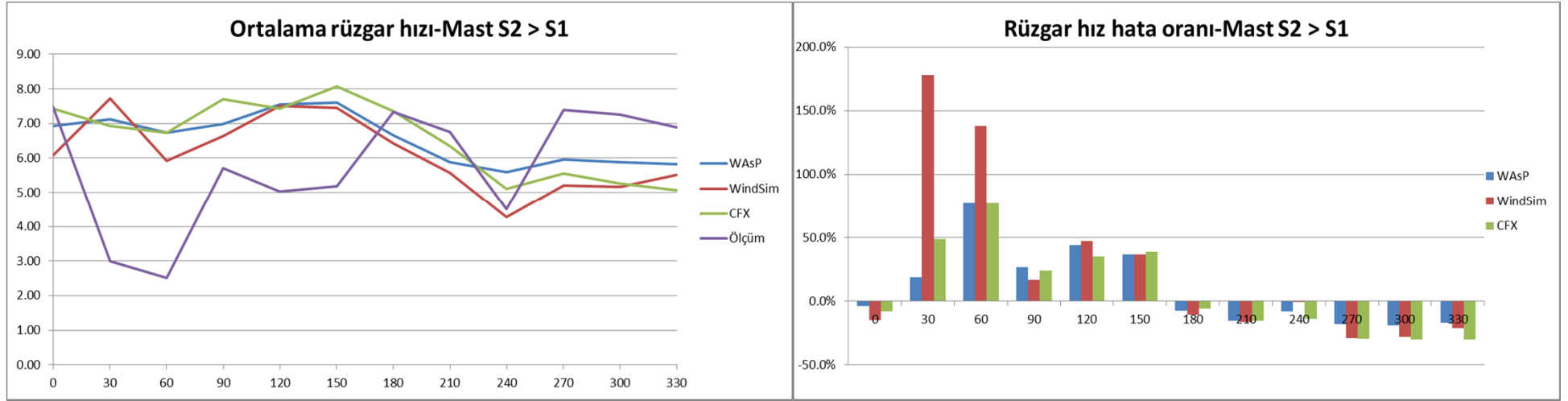
Mast S1 Kullanılarak Mast S2 Noktasındaki Model Çıktıları



*Mast S1 > S2 Sektörel Hızlar
ve Hata Oranları*

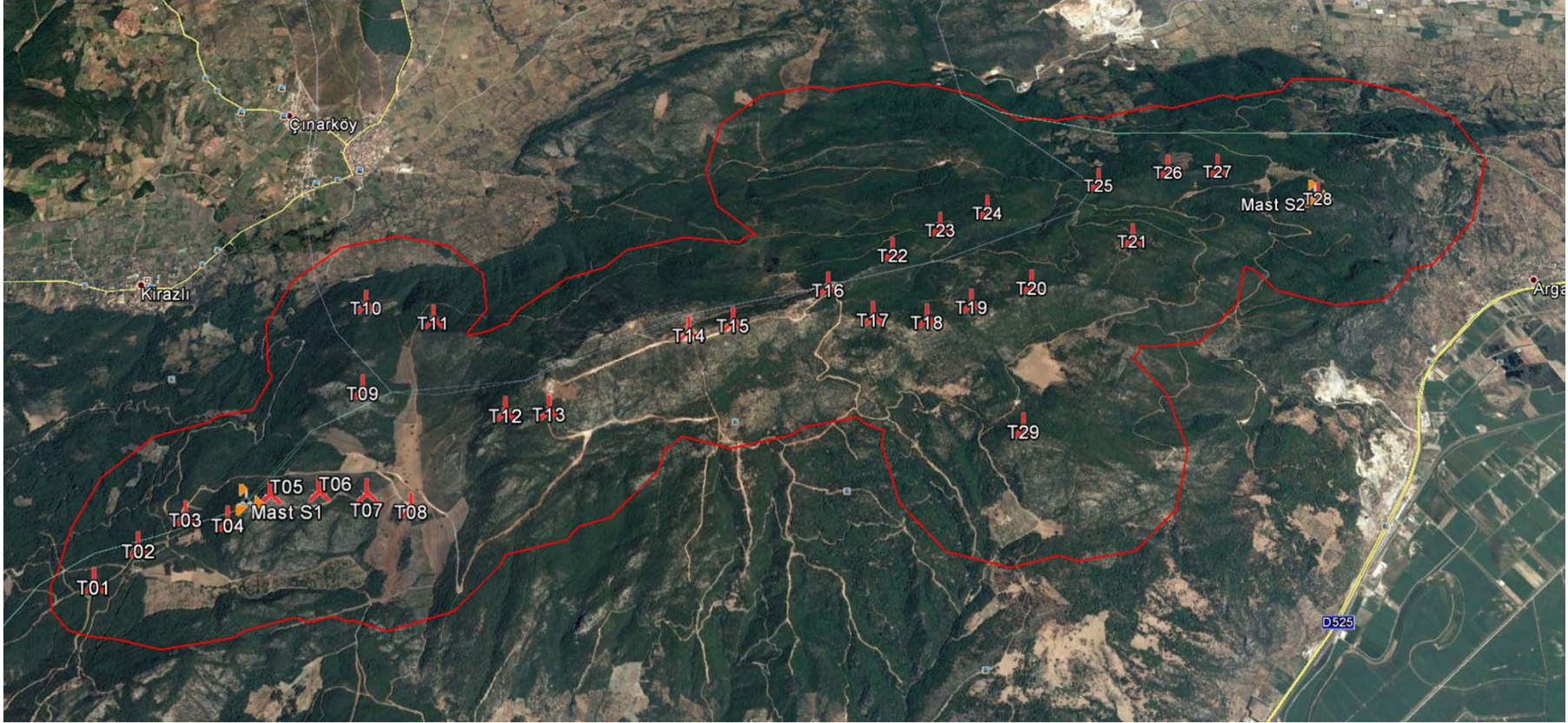
		0	30	60	90	120	150	180	210	240	270	300	330	Tümü	Bağıl hata	Mutlak hata
Ortalama rüzgar hızı-Mast S2>S1	WAsP	6.93	7.13	6.73	6.98	7.55	7.60	6.66	5.89	5.59	5.96	5.87	5.83	6.68		
	WindSim	6.08	7.72	5.92	6.63	7.51	7.45	6.42	5.57	4.27	5.21	5.17	5.51	6.32		
	CFX	7.43	6.93	6.73	7.70	7.42	8.06	7.34	6.35	5.10	5.55	5.26	5.07	6.75		
	Ölçüm	7.48	3.01	2.52	5.70	5.03	5.19	7.33	6.76	4.51	7.38	7.25	6.89	6.55		
Weibull k-Mast S2>S1	WAsP	2.38	2.39	2.02	1.64	1.82	1.94	1.89	1.78	1.76	2.70	2.87	2.62			
	WindSim	2.32	2.50	1.58	1.43	1.68	1.95	1.93	1.57	1.42	2.72	2.89	2.64			
	CFX	2.35	2.65	2.20	1.97	2.06	2.02	2.30	2.18	1.54	3.25	2.90	2.87			
	Ölçüm	2.26	1.34	1.84	2.36	2.00	1.32	1.97	1.96	1.20	2.56	3.01	2.31			
Frekans-Mast S2>S1	WAsP	14.4	10.0	4.0	3.2	7.9	16.7	5.5	3.3	3.2	7.7	10.7	13.2			
	WindSim	20.4	6.7	2.1	1.5	4.3	24.0	4.7	2.0	2.1	5.0	8.5	18.7			
	CFX	20.8	8.1	1.7	1.5	5.0	21.7	5.2	2.2	2.0	6.8	10.4	14.7			
	Ölçüm	11.5	1.7	1.6	10.0	8.6	5.9	11.1	4.5	1.4	6.4	18.3	19.1			
Rüzgar hız oranı - S2>S1/S1	WAsP	0.96	1.19	1.77	1.27	1.44	1.37	0.93	0.85	0.92	0.82	0.81	0.83	1.01		
	WindSim	0.85	2.78	2.38	1.17	1.47	1.36	0.89	0.84	1.00	0.71	0.72	0.79	0.98		
	CFX	0.92	1.49	1.77	1.24	1.35	1.39	0.94	0.84	0.86	0.70	0.70	0.70	0.94		
	Ölçüm	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Rüzgar hız hata oranı	WAsP	-4.0%	19.0%	77.2%	26.9%	43.9%	36.9%	-7.3%	-15.1%	-8.0%	-18.2%	-18.9%	-16.9%	1.5%	24.1%	1.32
	WindSim	-14.8%	178.2%	138.0%	16.9%	47.1%	36.5%	-10.6%	-16.3%	-0.4%	-28.9%	-28.1%	-21.3%	-2.4%	38.4%	1.79
	CFX	-8.0%	48.5%	77.0%	24.2%	35.2%	39.0%	-5.8%	-15.6%	-13.8%	-29.8%	-30.1%	-30.1%	-5.8%	28.5%	1.71

Mast S2 Kullanılarak Mast S1 Noktasındaki Model Çıktıları

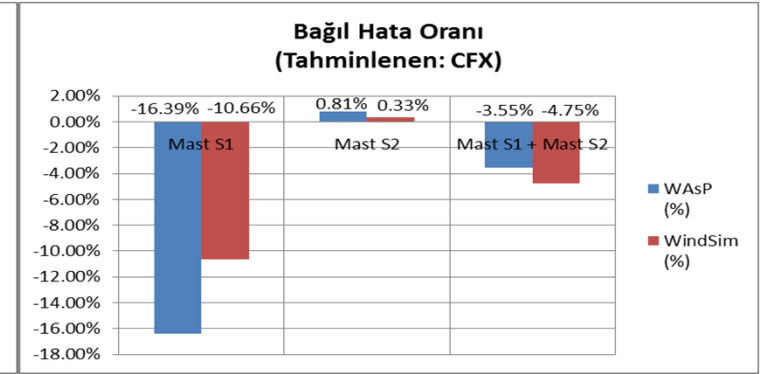
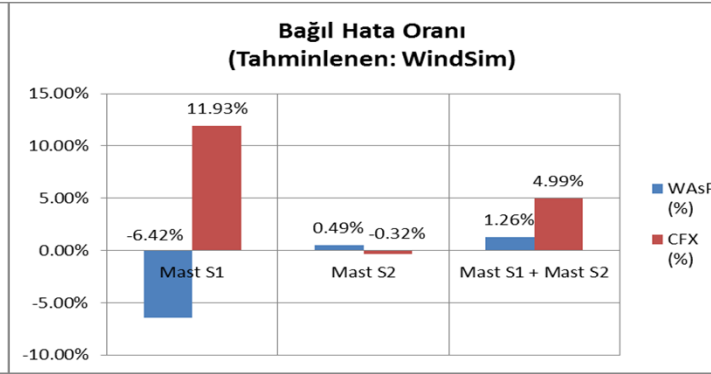
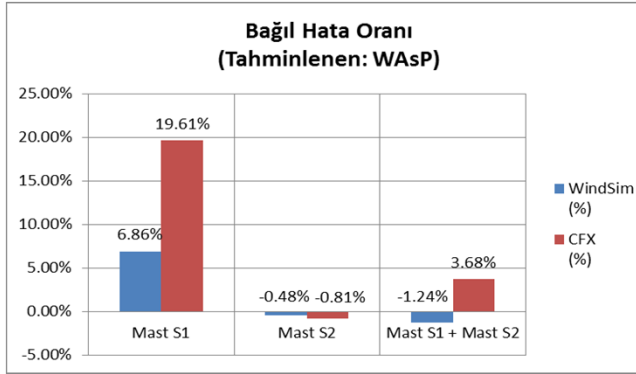
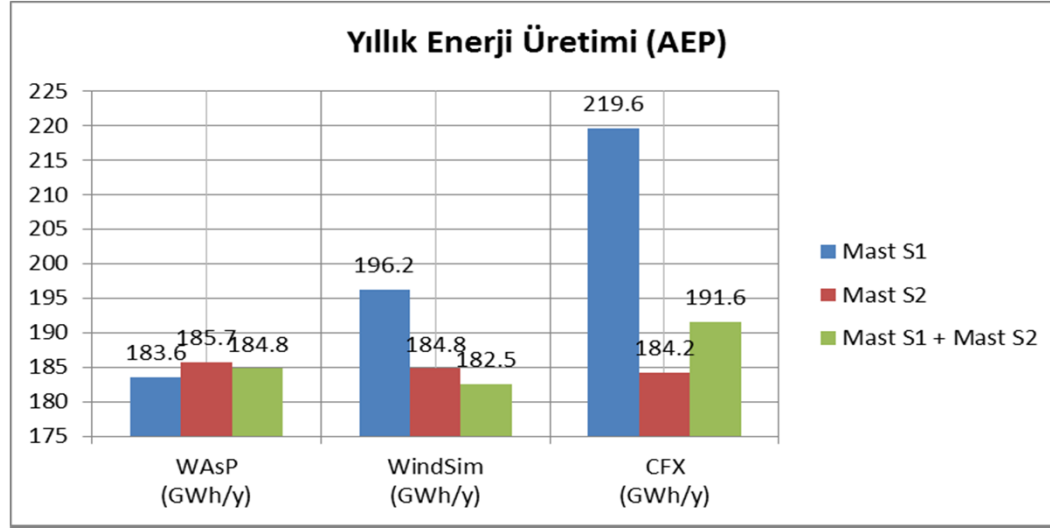


*Mast S2 > S1 Sektörel Hızlar
ve Hata Oranları*

5. Yıllık Enerji Üretim Tahminleri



Saha Yerleşimi



Modellere Göre Üretim Tahmin Karşılaştırması

Contact

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